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OFFICE OF EXPERIMENT STATIONS

A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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EXPERIMENT STATION RECORD.

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The place of the farmers' institute among the agencies for the advancement of agriculture and the assistance of the farmer becomes better defined every year. The results have stamped it as a highly important factor. Experience is demonstrating its proper field and scope and establishing its relations to the other agencies in the system, and its special mission and the means of accomplishing it are becoming clearer.

Like all movements of its kind, it has had to pass through an experimental period, in which it has been alternately a social gathering, a political rally, a lyceum, and a lecture course. It is now in a most important stage of its development, in which it is taking on more definite and logical form and being considered in its relations to other agencies for the moral and material uplifting of farm life.

The meeting of the farmers' institute workers at Toronto this year is a good illustration of the earnestness with which some of the fundamental problems relating to it are being considered, and of the change of sentiment which is taking place in the minds of many of the leaders in this work. Questions involving the future development of the work, of organization, and of providing a corps of trained institute specialists occupied a prominent place in the deliberations. The predominating sentiments and the approval with which they were received show a deeper conception of the purpose and possibilities of this work.

The president of the association, Prof. W. C. Latta, emphasized the high aim and purpose of the institute work in his annual address. He said: "The farmers' institute should be something more than a means of making agriculture more profitable. It should be made the means of uplifting the people morally and socially. To tell how to earn a dollar is a good thing, but to instruct in the wise use of the dollar when earned is better. The institute should be made the means of forever banishing the farmer's low estimate of himself and his calling, and be made the means of ridding farmers of the petty jealousies and suspicions which prevent them from intelligently cooperating with each other for mutual protection and advancement."

In other words, it should strive not only to increase the productiveness and quality of the staple products, but to elevate the ideals of

living. As long as the farmer looks upon his calling as a round of drudgery and is unable to derive stimulation and pleasure from that contact and sympathy with nature which education makes possible, the prospect will be one from which his sons will naturally shrink. Contentment is one of the first requisites to success; and, as Professor Bailey has said, "the compensation in farming is quite as much the pleasure of farming and the joy of being in the country and the satisfaction of being independent, as the mere money that is made."

This is one of the things which secondary agricultural education and the farmers' institute work are seeking to inculcate into the farmer's children especially. Education is the best possible means of elevating agriculture as a calling in the minds of the public and of the farmer himself. And the increased resourcefulness which comes from it will not only bring greater contentment, but will reflect itself in the improvement of farm methods.

A special feature of the institute work in a number of States has to do directly with the farm boys. Special sessions are held for them, and they are encouraged to conduct trials or experiments to add an interest to their work. In Illinois a corn-growing contest is going on this year, which is limited to boys under 18 years of age. Mr. F. H. Rankin, of that State, described his work among the boys and the means he is taking to interest them in farm life and in agricultural education. Every year an excursion is run at a very low rate to bring boys to the agricultural college at Urbana, in order that they may see what is offered there, and have their horizon broadened, their respect for agriculture increased, and their enthusiasm for agricultural education aroused. The results are already apparent.

The need for the farmers' institute springs primarily from the remarkable progress which agriculture has made in the past ten or fifteen years. Much of this is attributable to the work of the experiment stations. There is something new for the farmer to learn every year, which concerns his business as vitally as the latest improvement in labor-saving devices does the manufacturer. He not only should, but must learn these things, if he is to continue to be a good farmer. And this is the mission of his institutes, which bring to him the progress in science as applied to his art, presented in clear and concise form in which he can make use of it.

The success of the undertaking will depend, of course, primarily upon the institute worker, and as he is so important a factor it is not strange that much attention is now being given to the consideration of his qualifications. This matter was freely discussed at the Toronto meeting, and there was a very evident abandoning of some old ideas. "If the work of the institute is confined to telling of what the speakers themselves practice, the institute itself will soon be at an end. What

we must aim at is to teach men to think and reason for themselves." This was the comment of one speaker, and another stated that an institute could be most effectually killed by a semi-oratorical speaker with visionary ideas, or by droning out platitudes.

The standard of requirement has risen very materially, and calls for men of education and training. It is for this reason that experiment station workers and instructors at the agricultural colleges have been much sought as institute workers. They have a message for the farmer, and they have won his confidence by their experimental work and their writings. It is very natural to look to them to explain their work to the farmers verbally; and within bounds this can be defended upon the ground of the mutual benefit which results. But the calls upon the stations should steadily be relatively less, and they should not be expected to bear the brunt of the institute work. It is a distinct and independent line of work from that of the experiment stations, and is in the domain of instruction or university extension. Its aims and its methods of work, as well as its particular field, give it an individuality and distinguish it from all other agencies. The growth of the movement emphasizes the increasing need for the work of the experiment stations. They will furnish the basis for the institute work, as they have shown the need for it. It is well, therefore, to hold to the true conception of the station as being primarily a generator of information rather than a demonstrator and broadcast diffuser. The Office of Experiment Stations is now engaging more largely than formerly in work directly relating to the farmers' institutes, but it is not the intention to abate in any degree our former contention that research is the chief and distinctive business of the experiment station. It will be our effort to secure increased financial support for the institutes with a view to putting them on a more independent basis and relieving station workers from attendance upon the institutes which would in any degree interfere with their work as investigators.

The institute work is now recognized as constituting one of the great factors in the system of agricultural instruction which is being worked out in this country. These factors—nature study and agricultural instruction in the elementary and high schools, agricultural schools and colleges, farmers' institutes, and the experiment stations—are being correlated and their respective fields outlined.

In many States the institute work has been put well on its feet, and is considerably in advance of some of the related agencies. Farmers are believing in it more and more, and the attendance is increasing at a rapid rate. It must develop, as one of the speakers stated, or it will go to seed; and this development will naturally be in the direction of greater individuality and a more effective organization. The connection between it and the stations and colleges will almost necessarily

remain very close, for they are mutually dependent; but it will need eventually to develop a corps of trained institute workers as a nucleus around which to rally the assistance of the college and station workers and others.

This is the present tendency, and there was quite general agreement at the Toronto meeting as to the qualifications which these workers should possess. They should first of all be men well educated in the principles and practice of agriculture, and should keep themselves well informed through reading and contact with the experiment stations and agricultural colleges and with the centers of agricultural activity. They should be specialists in the sense that they devote themselves primarily to some division of the subject of agriculture and aim to keep posted upon that. The day for the all-around worker who is a sort of encyclopedia of universal knowledge has passed in most States. Agriculture is too vast a subject for any one man to cover, and the fund of knowledge is being added to too rapidly. They should, of course, have practical experience and be in thorough sympathy with farm life; and in addition to native ability they must needs be trained for institute work.

Such a class of specialists can not be brought together in a few months. They must be developed gradually, as our agricultural instructors and our station experts have been. Much time will be required, and hence the desirability of working in that direction.

In the meantime much can be done in training the institute forces for the season's campaign. This is already engaging the attention of institute directors, and in several States a beginning has been made. The New York State department of agriculture will hold a normal institute for the technical instruction of institute workers during two weeks of November. One week of the meeting will be held at the College of Agriculture at Cornell University and one week at the agricultural experiment station at Geneva. The plan of bringing the workers together for conference at the agricultural college once a year has been highly commended; and in several States steps have been taken to introduce a normal school plan for training lecturers as a part of their institute system. It is hoped that this Department may be able to contribute, directly and indirectly, toward the better equipment and training of these forces.

The States will not long refuse to appropriate money to place so laudable and popular a work as that of the farmers' institutes on a substantial and independent basis; and the development of interest in agricultural education of different forms will promote this end.

The Mount Hermon School, near Northfield, Mass., founded by the late D. L. Moody, has decided to establish an agricultural department and to offer courses of instruction in that subject. This step on the part of one of the largest secondary schools in the United States will

be a matter of interest to those who are following the progress of secondary agricultural education. It is the more significant from the fact that the institution is not a technical school and that this is the first attempt to establish an industrial course. It is another indication of the hold which this grade of agricultural education is taking.

The school has for some time had a farm of about a thousand acres, which is carried on quite largely with student labor. In consideration of the low rate of tuition and board, pupils are expected to work about fifteen hours a week and many of the boys have put in this time on the farm. As now operated it is said to yield a good profit. Much of the product finds a market at the boys' and girls' departments of the school and the Bible school, which together have and aggregate of about nine hundred students. There is at present a dairy of about two hundred cows, and fruit orchards of considerable proportions, together with a cannery for putting up vegetables, especially tomatoes, peas, and corn.

There has, however, been no theoretical instruction in agriculture or horticulture. Mr. Harry Hayward, a graduate of the school and for several months past assistant chief of the Dairy Division of this Department, has now been called to the school as director of the agricultural department, and entered upon his duties August 1. The department will be organized into divisions for horticulture, dairying, and field work; and courses will be offered in different branches of agriculture, which it is understood will be mainly elective. In other words, only such of the 425 boys in the school as are especially interested in agriculture will be required to take the courses, although others may be required to work on the farm as heretofore.

It is planned to carry the farm on with student labor to even a greater extent than in the past, with practical foremen at the head of the several departments. As the school runs practically the year round, there being three terms of sixteen weeks each, this plan will be feasible.

An effort will be made to make the instruction as practical as experience and the conditions surrounding the school will permit. A considerable number of the pupils come from the farming districts and expect to return to the farm, and the courses will be planned with special reference to their needs. With the equipment already at hand the opportunity would seem to be an unusual one for demonstrating the high value of agricultural courses in secondary schools.

NEW AGRICULTURAL BUILDING AT THE UNIVERSITY OF WISCONSIN.

Agricultural Hall, the new agricultural building of the Wisconsin College of Agriculture, makes provision for the administrative offices of the college and the experiment station, as well as the departments of agronomy, animal husbandry, bacteriology, and chemistry. In it are also located the offices of the superintendent of farmers' institutes.

The structure has a frontage of 200 feet by 64 feet in depth, and is three stories in height over an amply lighted, full-height basement. In the rear is an addition in the form of an octagon (only partly shown in the accompanying plans), two stories in height and 66 feet across. The building is constructed of buff pressed brick, terra cotta, and Indiana buff Bedford limestone. It has a roof of red tile, and all outside metal work, including cornice, is of copper. It is of slow-burning construction throughout.

Heat is supplied by the central heating plant of the agricultural college, the steam pipes being brought from the heating plant to the agricultural building in an ample tunnel. Running under the hallway of the basement is a large tunnel or "plenum," in which one can walk upright without inconvenience. This tunnel has a brick floor, brick sides, and plastered ceiling. Under it runs the sewer pipe. In it run steam, gas, water, and electric-wire pipes, all accessible. From this main tunnel or plenum run branches to vertical air ducts here and there throughout the building. The tunnel system is connected with the fan room. Tempered air is forced by an electric fan into the tunnel, thence into the various branches and upward into the several rooms. Other pipes carry the foul air picked up at the floor out through two large ventilating chimneys in the roof of the building. There are ample steam radiators to warm the building in addition to this indirect system.

The arrangement of the laboratories, lecture rooms, offices, etc., of the various departments accommodated in the building is shown in the accompanying plans. In addition to the usual facilities for these departments, there are five fire-proof vaults, document, museum, and seminary rooms, and an unusual number of closets and storerooms. Space has been reserved for one or two departments not yet organized. The mailing room is located near the east entrance, which has a porte cochere, affording protection from storms in handling mail matter. There is a large room for the storage of extra bulletins and reports; also a room for duplicates from the library.

WISCONSIN UNIVERSITY, AGRICULTURAL BUILDING.

On the basement floor of the octagon at the rear is located the agricultural library, with accommodations for 20,000 volumes, and a large reading room. On the floor above is an auditorium, a gallery communicating with the second floor. This hall has a seating capacity of over 700 and is unobstructed by posts. The octagon form brings the audience as close as possible to the speaker, both on the main floor and in the gallery.

Plate I shows the building in a somewhat incomplete condition. When completed there will be a stone railing around the east portico, and an ornate, wide balustrade stairway of cut Bedford stone will furnish the approach up the sloping incline to the front entrance. It will be ready for occupancy in the early fall.

For this building the legislature of 1901 appropriated $150,000. Architect's fees, grading the grounds, and other initial expenses were not covered by this appropriation. The plans were drawn and the construction supervised by Mr. J. T. W. Jennings, the university architect. The legislature of 1903 made a further appropriation of $25,000 for the necessary furniture and fixtures.

With the completion of this building the agricultural college will occupy a group of four buildings located at the west end of Observatory Hill. These are all devoted strictly to agricultural instruction and experiment station work, the training which agricultural students receive in science, language, mathematics, mechanics, etc., being given in the other departments of the university. The farm barns are located about 60 rods farther west.

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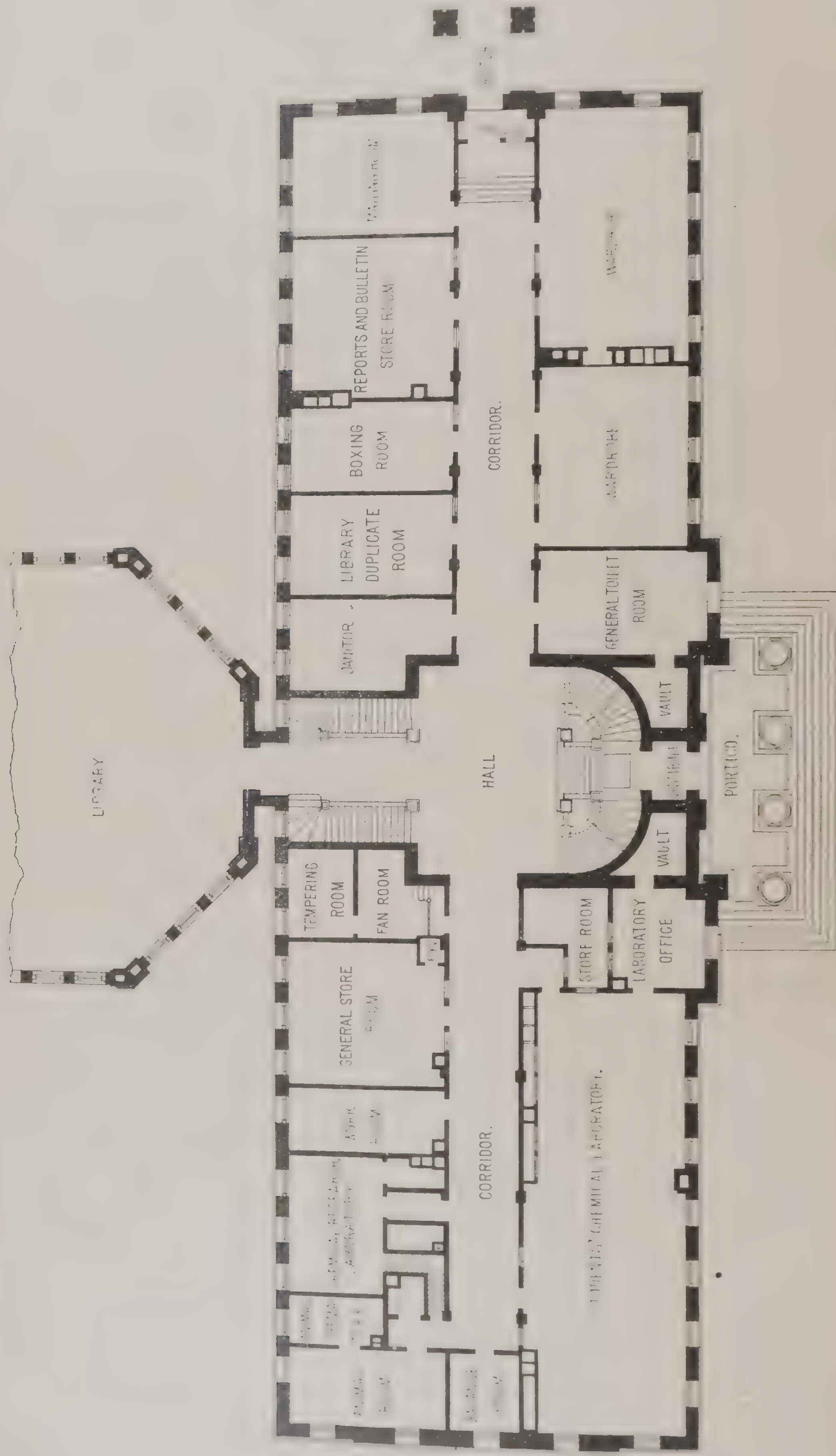


FIG. 1.—Basement plan, Agricultural Building, Wisconsin University.

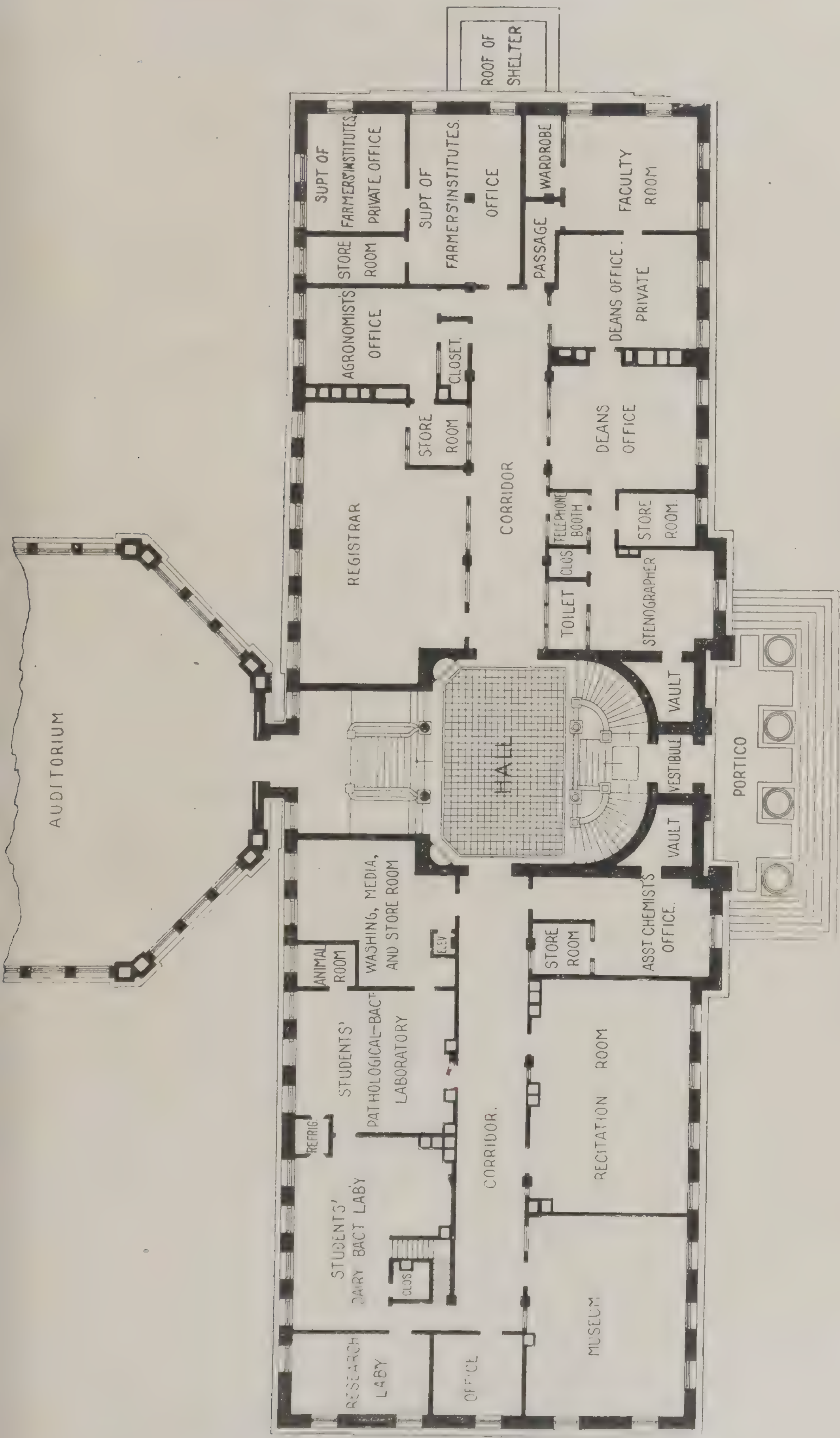
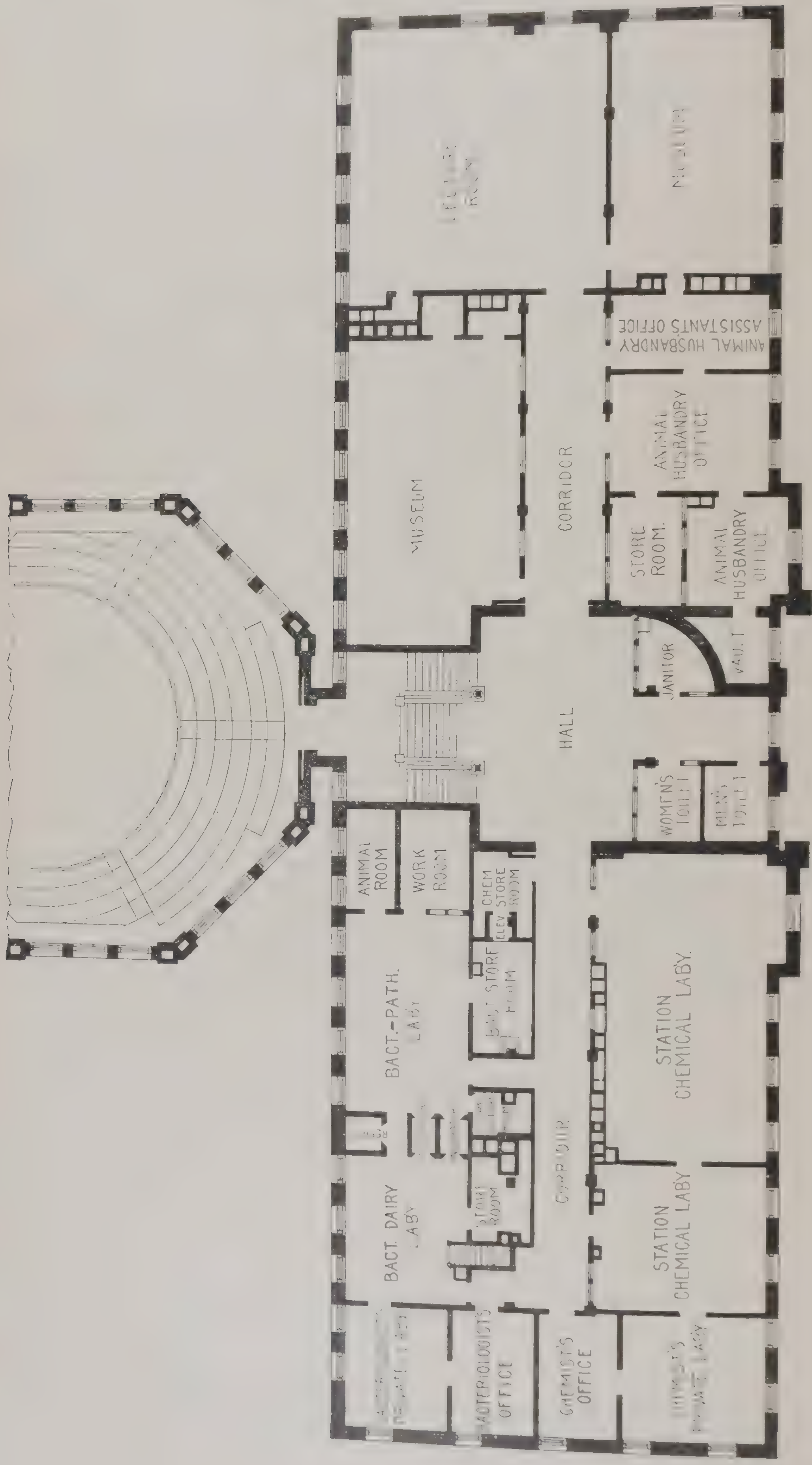


FIG. 2.—First-floor plan, Agricultural Building, Wisconsin University.


MUSEUM
ANIMAL HUSBANDRY ASSISTANTS OFFICE
ANIMAL HUSBANDRY OFFICE
MUSEUM
CORRIDOR
STORE ROOM.
ANIMAL HUSBANDRY OFFICE
JANITOR
VAULT
HALL
WOMEN'S TOILET
MEN'S TOILET
ANIMAL ROOM
WORK ROOM
CHEM STORE ROOM
ELEV
BACT. STORE ROOM
BACT.-PATH. LABY
STATION CHEMICAL LABY.
CORRIDOR
STORE ROOM
BACT. DAIRY LABY
STATION CHEMICAL LABY
BACTERIOLOGISTS OFFICE
CHEMIST'S OFFICE

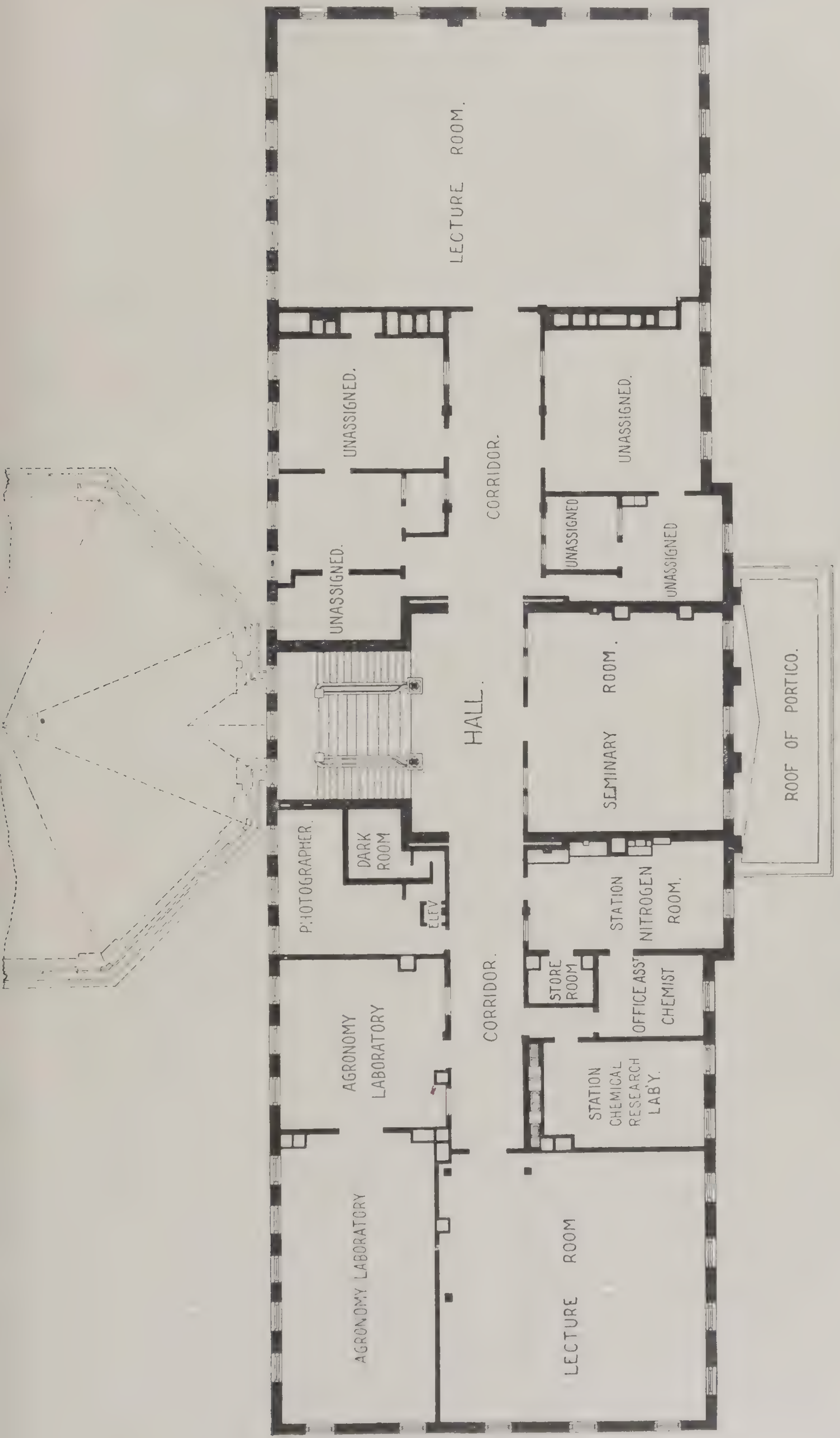


FIG. 4.—Third-floor plan, Agricultural Building, Wisconsin University.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Report on progress in agricultural chemistry, F. Mach (*Chem. Ztg., 27 (1903), No. 35, pp. 417–422*).—A brief review with numerous references to literature published during the past year.

The chemistry of plant and animal life, H. Snyder (*Easton, Pa.: Chemical Publishing Co., 1903, pp. XVII+406, pls. 3, figs. 102*).—It is stated in the preface that this book is the outgrowth of instruction in chemistry given in the School of Agriculture of the University of Minnesota since 1891. The opening chapters are devoted to the elements and simpler compounds of plants and animals and the laws governing their combinations, after which the composition of plant and animal bodies, chemistry of plant growth, composition of feeding stuffs, chemistry of digestion and nutrition, rational feeding of animals and men, and other subjects are discussed. Exercises and questions are included.

Ash constituents of cereals, W. P. Gamble (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 48–51*).—Determinations were made of the total ash and the different constituents in the grain and straw of barley, the method used being that of Shuttleworth (E. S. R., 11, p. 304). In the preparation of an ash from a cereal low in silica, as oat straw, the fusion of the ash in the author's experience was not prevented by this method. Lower figures for silica and higher figures for potash than those reported by older methods of analysis were obtained, indicating that previously some of the potash was left in combination with silica. The results of the analyses are given in the following table:

Composition of barley ash.

Constituents.	Grain.	Straw.	Grain.	Straw.	Ratio of constituents in grain and straw.
Material	*Per cent.*	*Per cent.*	*Grains.*	*Grains.*	
Total ash	.....	.....	20.3200	34.1240	.....
SiO_2	2.19	9.70	.4460	3.3370	1 : 7.5
Fe_2O_3	9.60	16.70	.0427	.5674	1 : 13.3
CaO	2.40	1.10	.0107	.0367	1 : 3.4
MgO	4.20	7.60	.0187	.2536	1 : 13.6
P_2O_5	12.00	4.90	.0535	.1635	1 : 3.06
K_2O	30.20	2.10	.1347	.0701	1 : 0.52
Na_2O	26.50	38.50	.1182	1.2847	1 : 10.87
SO_3	23.60	25.20	.0467	.0020	1 : 0.04
Cl	1.40	.45	.0070	.1068	1 : 15.33
	1.56	3.20	.1053	.8409	1 : 8.00

It is estimated that a crop of barley yielding 40 bu. per acre would remove 11.5 lbs. of potash and 13 lbs. of phosphoric acid in the grain and 125 lbs. of potash and 6.5 lbs. of phosphoric acid in the straw. The amount of potash thus removed is greater than usually reported. The desirability of returning the straw to the soil is emphasized.

Ash analyses of some New Mexico plants, A. Goss (*New Mexico Sta. Bul. 44, pp. 14*).—Ash analyses of the following plants are reported: Salt grass (*Distichlis spicata*); bunch grass (*Sporobolus airoides*); sea blite (*Dondia suffrutescens*); cachanilla (*Pluchea sericea*); shadscale (*Atriplex canescens*); creosote bush (*Larrea tridentata*); popotillo (*Ephedra trifurca*); century plant (*Agave aplanata parryi*); sotol, stem and leaves (*Dasylirion wheeleri*); soapweed, stem and leaves (*Yucca radiosa*); Spanish dagger, stem and leaves (*Y. macrocarpa*); ocotillo (*Fouquiera splendens*); prickly pear (*Opuntia camanchica* and *O. macrocentra*); tree cactus (*O. arborescens*); chico bush (*Sarcobatus vermiculatus*), and alfalfa. The different plants are described in connection with a discussion of their composition. Among the general conclusions drawn are the following:

"Plants such as Yuccas, sotol, and prickly pear growing on the arid plains and hill sides where there is very little moisture in the soil, seem as a rule to be very high in ash, although there are exceptions such as ocotillo. In general, all the plants of this region seem to average higher in ash than the plants of the rainfall districts. This is probably due to the more concentrated solutions of mineral matter present in the soils in which they grow.

"In regard to the mineral contents of plants growing on alkali soils, there does not seem to be very much uniformity. Salt grass and bunch grass, for example, while containing something like an average amount of ash, are much lower in soda, potash, lime, magnesia and the other elements usually found in alkali, than many of the plants growing on soils containing much less alkali. The principal portion of the ash of these grasses is silica which does not form a part of alkali at all. On the other hand, the sea blite and chico bush, both alkali loving plants, are very high in soda and some of the other elements found in alkali, and do not contain nearly so much silica as the grasses. Again, in this connection, the prickly pears taken from a limestone hill are very remarkably high in both ash and lime, whereas ocotillo, taken from the same place, is low in both ash and lime. It would seem, therefore, that the species of the plant has perhaps more to do with its mineral composition than the environment under which it grew."

The sea blite is suggested as possibly useful in the removal of alkali from lands. From the average results of analyses of 4 cuttings of alfalfa it is estimated that there is removed in each ton of dry alfalfa 48.8 lbs. of nitrogen, 68.2 lbs. of potash, and 8.2 lbs. of phosphoric acid, estimated at eastern prices at $11.14.

A comparative study was made of the sulphur in ash as determined by the official method of the Association of Official Agricultural Chemists and in the plant as determined by the method of fusion with potash and potassium nitrate. In the latter method large iron crucibles were finally used in place of platinum crucibles, which were seriously injured. Averaging the results for all the samples the sulphur in the ash was 0.29 per cent and in the plant 0.71 per cent. The percentage of sulphur lost in burning varied in different plants and ranged from 34 to 94 per cent. The determination of sulphur in the ash with a view to determining the amount originally present in the plant is therefore considered absolutely worthless.

Detection and determination of ammonia in waters by means of diaminophenol, Manget and Marion (*Ann. Chim. Analyt., 8 (1903), p. 83; abs. in Jour. Chem. Soc. [London], 84 (1903), No. 487, II, p. 390*).—It is stated that diaminophenol (amidol) is superior to Nessler reagent for detecting and determining traces of ammonia in waters. It very distinctly shows 1 part per million or even less.

Investigation of the fat of guinea corn (Andropogon sorghum), N. F. Andreyev (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, pp. 145–180*).—The seed of guinea corn (*Andropogon sorghum*) is an important cattle feed in Turkestan. Recently the question of its suitability as a fodder for military horses has attracted considerable attention, some empirical trials having given encouraging results. In view of the fact that the favorable effect of oats on horses has been ascribed by some to the high fat content, the author made a study of the fat of

guinea corn. The corn contains over 4 per cent of fat. The constants obtained for the fat were as follows: Specific gravity at 15° C., 0.9282; melting point of fat, 39–40°; melting point of fatty acids, 43–44°; saponification equivalent of fat, 172.1; saponification equivalent of fatty acids, 175.6; saponification equivalent of free acids, 13.86; Hehner's number, 96.1; Reichert-Meissl number, 2.1; iodin number of fat, 98.89; iodin number of fatty acids, 101.63; acetyl number (after Benedict and Ulzer), 9.26, and acetyl number (after Lewkowitsch), 6.85. The ratio of the liquid to the solid acids was as 26.09:72.72. The total content of volatile acids was 0.32 per cent. These proved to be valeric and formic, in the ratio of 2:1.

The fatty acids were converted into ethyl esters, which were subjected to distillation under diminished pressure. The esters in separate fractions were saponified, and from the soaps the respective acids were set free and oxydized with potassium permanganate in alkaline solution.

The conclusions of the author are as follows:

(1) Among the solid acids, which form 96 per cent of the ether extract of the seed of guinea corn, erucic acid predominates and impresses on the fat some of its own characteristics.

(2) The erucic acid is accompanied by small quantities of oleic (ricinoleic) and linoleic acids.

(3) The simultaneous presence of the predominating erucic acid and of oleic acid imparts to the fat a certain likeness to the fat of oats, while the linoleic acid imparts a slight resemblance to the fat of maize.

(4) The presence of a small quantity of linoleic acid accounts for the slow-drying of the fat and for the rapid changeability of guinea-corn flour.

(5) Besides the acids mentioned, volatile fatty acids and oxyacids are present in the fat of guinea corn, valeric acid predominating among the volatile acids, and ricinoleic acid apparently predominating among the oxyacids.—P. FIREMAN.

Action of sulphuric acid on legumen, D. P. PRYANISHNIKOV (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *8* (*1902*), *No. 4, pp. 375–384*).—The present investigation is an attempt to trace quantitatively, step by step, the process of the decomposition of albumen (legumen) under the influence of weak (4 per cent) sulphuric acid.

The conclusions of the author are as follows:

(1) Four per cent sulphuric acid acts energetically on albumen on the application of heat, causing a rapid decrease of that body and transforming it into compounds not precipitated by cupric oxid.

(2) Among the latter compounds from the very first stages of decomposition appear substances not precipitable by phospho-molybdic acid, increasing rapidly in quantity; toward the end of the experiment two-thirds of the total nitrogen is present in this form. Hence, it is very probable that dilute acid causes the decomposition of albumen to proceed as far as the formation of amido-acids.

(3) The nitrogen of ammonia as well as of organic bases shows a gradual increase, the amount of the former reaching one-tenth toward the end of the experiment and of the latter up to two-tenths of the total nitrogen.

(4) The peptones play the part of an intermediate product, and in accordance with this their amount is large at the beginning of the experiment and, after obtaining a certain maximum, falls off toward the end of the experiment. A more correct estimate of the quantity of peptones and similar compounds can be had when the precipitation with tannin is carried out in the absence of copper compounds.—P. FIREMAN.

A new eudiometer, M. SILBERBERG (*Ztschr. Landw. Versuchsw. Oesterr.*, *6* (*1903*), *No. 6, pp. 591, 592, fig. 1*).

Résumé of the reports of the directors of the government analytical laboratories, 1902 (*Résumé des rapports des directeurs des laboratoires d'analyses de l'état*

pour l'exercice 1902. Brussels: P. Weissenbruch, 1903, pp. 50).—During the year 21,715 samples were analyzed at the 7 government laboratories in Belgium. These included fertilizing materials, feeding stuffs, human foods, and miscellaneous materials. The maximum, minimum, and average results are reported in tabular form and the work at each laboratory is further discussed.

BOTANY.

Economic plants of Porto Rico, O. F. Cook and G. N. Collins (*Smithsn. Inst., U. S. Nat. Mus., Contributions from the U. S. National Herbarium, vol. 8, No. 2, pp. III+57–269, pls. 48, figs. 2*).—A list is given of the economic plants of Porto Rico, the arrangement being an alphabetical one and the scientific and the Spanish and English popular names being given of the different plants, so far as their identification was assured. The authors have compiled this information from a number of sources, including their personal observations in 2 trips to Porto Rico and a study of the available literature relating to the botany of the island. In many instances descriptive notes are given and statements made regarding the economic value of the different plants described. Suggestions are given of a number of species of economic tropical plants which in the estimation of the authors would probably prove valuable if introduced into the country.

Studies of Mexican and Central American plants—No. 3, J. N. Rose (*Smithsn. Inst., U. S. Nat. Mus., Contributions from the U. S. National Herbarium, vol. 8, No. 1, pp. XI+55, pls. 12, figs. 11*).—Descriptions are given of a number of hitherto undescribed species of plants collected by the author and others in various localities in Mexico and Central America. Notes are given on a number of species which appear to have economic value, and living specimens of some of the more interesting forms are now under observation in this Department.

A study of certain Mexican and Guatemalan species of Polypodium, W. R. Maxon (*Smithsn. Inst., U. S. Nat. Mus., Contributions from the U. S. National Herbarium, vol. 8, No. 3, pp. V+271–278, pls. 2*).—Critical notes and descriptions of new species are given of a number of ferns of the genus Polypodium.

Poison ivy, G. E. Stone (*Massachusetts State Bd. Agr. Nature Leaflet 9, pp. 4, figs. 3*).—Popular descriptions are given of the poison ivy (*Rhus toxicodendron*) and some of its related species, and remedies suggested for the poisoning produced by these plants. For this purpose repeated applications of an alcoholic solution of lead acetate are recommended. The author has conducted some experiments on the extermination of this pest and has found that arsenate of soda is quite efficient for its destruction.

Textile plants cultivated in Brazil and Argentina, C. D. Girola (*Bol. Agr. y Ganaderia, 2 (1902), No. 34, pp. 43*).—Descriptions are given of the textile plants which are native or introduced in Brazil and Argentina, and which are more or less exploited for their fibers. The list of fiber plants includes flax, hemp, jute, ramie, China grass, New Zealand hemp, Manila hemp, cotton, etc.

The effect of climate on modifications of the anatomical structure of plants, G. Bonnier (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 26, pp. 1285–1289*).—In continuation of the experiments conducted by the author on the effect of climate in modifying the structure of various plants, a report is given showing the modified structure of plants grown in the vicinity of the Mediterranean and at the laboratory of Fontainebleau, France. The plants were selected in the Mediterranean region and one lot planted in pots in that region, the second lot together with soil transferred to the laboratory at Fontainebleau and there grown in the open air. The only difference in conditions are those attributed to the difference in atmospheric phenomena. The climate of the 2 regions is compared, by which it is shown that the growing season of the Mediterranean is 260 days, as compared to 178 days at the other station. The temperature of the 2 regions is compared, from which it is seen

that the available temperature at Toulon on the Mediterranean is about 4600° C. as compared to 2750° for the vicinity of Paris. The most striking difference between the 2 regions is the occurrence of definite wet and dry seasons in the Mediterranean.

The plants experimented upon were trees and shrubs, mostly beeches, mulberries, locusts, linden, ash, lilac, and euonymus. In general the trunks and spring wood were best developed in the Mediterranean region. The vascular system was larger and more abundant in the spring growth in the same species of plant cultivated in the Mediterranean than at Fontainebleau. The parenchyma was more lignified at Toulon and this lignification was affected mostly during the period of drought. The leaves of the arborescent species were thicker at Toulon than at Fontainebleau, the palisade parenchyma in some cases being 2 or 3 times as thick as in the more northern-grown plants.

Among the other adaptations which were attributed to the climatic conditions were those in leaves to reduce transpiration during periods of drought. This was affected most in the plants grown near the Mediterranean. While the stomata were very numerous they were often completely closed and depressed in the surface of the leaf. Annual species of plants whose stems died down during a period of drought did not show any of these modifications which are described for the perennial species.

The upper temperature limits of life, W. A. SETCHELL (*Science, n. ser., 17 (1903), No. 441, pp. 934–937*).—An account is given of investigations of the organisms inhabiting hot springs, in which an attempt was made to ascertain the upper temperature limits of plant life. In the author's investigations it was found that unless considerable care was exercised the accurate temperature of the thermal springs would not be correctly ascertained. Special precautions were taken to determine accurately the temperature of the waters, and the results of the observations are given at considerable length. For the strictly thermal waters, that is, those having temperatures of 43 to 45° C. or above, no animals were found, although careful search was made for them, nor were any living diatoms discovered under such conditions. The only organisms found were groups of plants belonging either to the Schizophyceæ or Schizomycetes. The chlorophyll-bearing members of these groups continued common in temperatures up to 65 or 68° C., and in some cases, although not so abundant, at 75 to 77°. The chlorophylless Schizomycetes are apparently able to endure the highest temperatures of living organisms, as they were found abundant at 70 to 71° C. and remained in considerable quantity at 82 and 89°. The temperature of 89° C. was the highest at which the author was able to find any living organisms.

Living organisms were found at higher temperatures in siliceous waters than in calcareous waters. The limits of life in the siliceous waters were determined by the author's observations to be between 75 and 77° for the chlorophyll-bearing and 89° for the chlorophylless plants. In the calcareous waters the limits of endurance were between 60 and 63° for the chlorophyll-bearing Schizophyta and 70 and 71° for the chlorophylless species. No organisms were found in springs which had a decided acid reaction. A careful study of the species of thermal Schizophyta showed that they were either filamentous or unicellular, but in each case the filaments or cells were inclosed within an abundant mass of jelly.

Chemical stimulation and the evolution of carbon dioxid, E. B. COPELAND (*Bot. Gaz., 35 (1903), Nos. 2, pp. 81–98; 3, pp. 160–183, figs. 2*).—While engaged in a study of the poisonous properties of certain chemicals, the author noted the acceleration of growth in many of the cultures, which led to a series of studies in water cultures to determine the cause of this variation. In considering the growth of the plants the increased respiration was taken as the factor to be considered, and the effect of various substances on the liberation of carbon dioxid was examined. The methods are described in detail. As subjects of the experiments the author used various aquatic plants, such as Cardamine, Callitriche, Ceratophyllum, Potamogeton, Elodea,

as well as tadpoles and some immature fish. The killing point of the different substances for these plants and animals was determined and the death point was used in comparing results.

From a careful review of the results obtained the author claims his method is reliable within a very slight degree of variation. Of a large number of so-called poisonous substances the author found that all acted in certain respects as stimulants. The metallic salts were found to drive the carbon dioxid from the carbonates in the cell sap. This pseudorespiration is in many cases as active as the real respiration of the plant. It was found that carbon dioxid would be given off from the filtered sap of crushed Elodea much more rapidly than from the same plant without injury. The stimulation of potassium salts was found to be greater than that of sodium salts in about the proportion of their relative toxicity. There was no constant difference found between the chlorids and nitrates. The excessive evolution of carbon dioxid under the conditions of the experiment is considered a feature in the death of the plant. Just when the plant begins to die is hard to determine, as the cells in a single leaf do not all die together, and dead cells may become conspicuous, while a large part of the plant is still evidently alive. The evolution of carbon dioxid may continue after the plant, as judged by its physical appearances, would be called dead.

The occurrence of spherulins in plant families, L. Petit (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 22, pp. 991, 992*).—The author has given the name spherulin to certain substances which exist in chlorophyll cells of leaves of plants, being present as minute globules which are strongly colored by a tincture of alkanna. He has investigated a large number of families of plants to determine the presence of this substance and arrives at the conclusion that it is of rare occurrence among the families of Apetalæ and monocotyledons.

Experimental studies on inulase, A. L. Dean (*Bot. Gaz., 35 (1903), No. 1, pp. 24–35*).—A study was made of the inulase of Aspergillus and Penicillium to discover whether or not it was identical with the inulase of artichokes reported by Green in 1888. Pure cultures of *Aspergillus niger* and *Penicillium glaucum* were obtained and comparisons made with inulin prepared from Dahlia by alcoholic precipitation. The method of obtaining preparations of inulase is described at length, as well as the influence of various factors on the activity of the enzym. The author was able to confirm the presence of inulase in these molds, and as the enzym of these fungi does not pass into the culture medium it is to be classed as an endoenzym. Inulase acts most vigorously in a medium slightly acid, the enzym being destroyed by 0.01 normal sulphuric acid. Alkalis hinder its activity, 0.0001 normal potassium hydroxid being injurious. The optimum temperature for the action of inulase was found to be about 55° C.

Influence of formaldehyde on the growth of some fresh water algæ, R. Bouilhac (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 26, pp. 1369–1371*).—The effect of adding formaldehyde in weak solution to a culture medium in which *Nostoc punctiforme* and *Anabæna* sp. are grown was investigated, from which the author decides that formaldehyde may serve as a nutrient for these algæ and that a certain amount of light is necessary to permit them to polymerize the formaldehyde. The limit of the amount of light required is very nearly that which is necessary for plants to decompose carbon dioxid of the air.

The motility of Rhizobium mutabile, A. Schneider (*Bot. Gaz., 35 (1903), No. 1, pp. 56–58*).—In the previous communications of the author in relation to this root tubercle organism he has stated that it was absolutely nonmotile, but recent events have caused a review of this subject in which the organism was grown on a number of different kinds of media and it was found that it was nonmotile in most neutral media, but was decidedly motile in acid media, whether the media were liquid or solid. The motile forms are much smaller and more uniform in size than the nonmotile ones.

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev., 31 (1903), Nos. 1, pp. 1-52, figs. 21, charts 11; 2, pp. 53-108, figs. 28, charts 11; 3, pp. 109-164, figs. 13, charts 10*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of January, February, and March, 1903, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 1.—Special contributions on Synchronous Changes in the Solar and Terrestrial Atmospheres (illus.), by F. H. Bigelow; High Winds in Mountain Valleys, by A. D. Elmer; The Southern Limit of a Northwest Gale, by H. H. Ten Broeck; Inductive Studies in Weather Influence, by E. G. Dexter; Elasticity at Low Temperatures (illus.), by J. R. Benton; Violent Wind in South Dakota, by S. W. Glenn; The Vertical Component of the Movement of Clouds Measured by the Nephoscope, by L. Besson; Local Peculiarities of Snowfall, by E. L. Mosely; and The Structure of Cyclones and Anticyclones on the 3,500-foot and 10,000-foot Planes for the United States (illus.), by F. H. Bigelow; and notes on the meteorological reporter to the Government of India, bombarding against hail, horizontal curvilinear movement of clouds, the Scottish Antarctic Expedition, and the climates of geological ages.

No. 2.—Special contributions on The Temperature and Rainfall Departures at Hawaii, as Duplicated in New England Sixty Days Later, by A. D. Elmer; Some High Wind Records on the Pacific Coast (illus.), by A. G. McAdie and W. W. Thomas; Note on the Anemometer Exposure at Point Reyes Light, Cal., by C. F. Marvin; Composite and Other Arrangements of Weather Types (illus.), by H. W. Richardson; Meteorology in the National Agricultural Institute of France, by Miss R. A. Edwards; and The Mechanism of Countercurrents of Different Temperatures in Cyclones and Anticyclones (illus.), by F. H. Bigelow; and notes on James Glaisher, snow from a clear sky, sunshine records at Hamburg, Germany, aerial research in Denmark, courses of instruction in meteorology, Hann's climatology in English, and origin of the word "barometer."

No. 3.—Special contributions on Climatology of the Isthmus of Panama (illus.), by H. L. Abbot; Mean Barometric Pressure at Sea Level on the American Isthmus, by H. L. Abbot; Notes on a Feeble Earthquake Recorded at Washington, D. C. (illus.), by C. F. Marvin; The Districts of the Dominion of Canada (illus.), by R. F. Stupart; The Semidiurnal Tides in the Northern Part of the Indian Ocean (illus.), by R. A. Harris; The Endowment of Research in Meteorology, by T. C. Chamberlin; and March Winds, by B. C. Webber; and notes on second Russian congress on climatology, weather cycles and farmers' almanacs, Chavanne's Temperature and Rainfall in Argentina, the weather in Venezuela, the Cuban meteorological service, student assistants in the United States Weather Bureau, an arctic magnetical and meteorological station, William Kaucher, the first use of the word "barometer," and notes on the barometric pressure at Colon and Alhajuela.

Report on the barometry of the United States, Canada, and the West Indies, F. H. Bigelow (*U. S. Dept. Agr., Weather Bureau Rpt. 1900-1901, II, Chapters 1, 2, 6, 8, pp. 1-117, 423-624, 640-771*).—This report "contains a revision of the meteorological data which have become available since the opening of the Government service in 1871, in order to prepare it on modern scientific principles for the forecasting work of the Bureau. It contains the material necessary for constructing daily weather maps on three planes, the sea level, the 3,500-ft. plane, and the 10,000-ft. plane; also normal values of the pressures, temperatures, and vapor pressures at the stations and on these 3 planes." Of the 4 methods which have previously been used in reduction of barometric data the author adopted that of Ferrel, but "added another for local abnormality, computed the effect of the vapor pressure separately from that of the free air, and discussed thoroughly the tempera-

ture argument, so that these, added to the usual free-air reductions, give the ones required for the plateau districts."

Meteorological records, J. E. Bonebright (*Idaho Sta. Bul. 35, pp. 120–133*).—Daily observations on temperature, pressure, precipitation, and cloudiness at Moscow, Idaho, for each month of 1901 are reported.

Meteorological observations, C. D. Woods (*Maine Sta. Bul. 88, pp. 218–220*).—A summary by months of observations at Orono, Me., during 1902, on pressure, temperature, precipitation, cloudiness, and wind movement.

Meteorological observations at the Michigan Agricultural College for 1901 (*Michigan Sta. Rpt. 1902, pp. 83–107*).—Tabulated daily and monthly summaries of observations during 1901 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc. The summary for the year is as follows: Mean temperature, 46.98° F.; humidity, 91.71 per cent; atmospheric pressure (reduced to 32° F.), 29.161; cloudiness, 47.58 per cent; amount of rain or melted snow, 32.23 in.; snowfall, 42.05 in.; number of thunderstorms, 28.

Rainfall and temperature, 1902, J. B. Reynolds (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, p. 13*).—A tabular summary by months of observations at Guelph on temperatures and precipitation averages for 1902 and the two preceding years is given.

Report on the meteorological observations made at the Royal Horticultural Society's gardens at Chiswick in 1902, E. Mawley (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1903*), *No. 4, pp. 1073–1081, figs. 3*).—The temperature, humidity, and precipitation of each month of the year are reported in notes, tables, and diagrams. The air temperature is also compared with soil temperatures at depths of 1, 2, and 4 ft.

Report of the Meteorological Council (*Rpt. Meteor. Council* [*Great Britain*], *1902, pp. 163, pl. 1, fig. 1, maps 5*).—An account of the work of the council during the year ended March 31, 1902, in the lines of ocean meteorology, weather telegraphy and forecasts, climatology, and miscellaneous investigations is given, with statements regarding publications of the council and its library and finances. Information of a miscellaneous character is given in a series of appendixes. The success of 8.30 p. m. forecasts during 1901–2 was, complete 58 per cent, partial 26 per cent, sum of complete and partial 84 per cent. The averages for the preceding 10 years were, complete 55 per cent, partial 27.1 per cent, sum 82.1 per cent.

Weather forecasting according to the phenomena of light in the atmosphere, P. I. Brownov (*Trud. Selsk. Khoz. Meteor., 1902, No. 2; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *3* (*1902*), *No. 6, p. 814*).—A summary of literature on observations on the atmospheric light phenomena, with a view to the study of the connection between the optical phenomena and the state of the weather.—P. FIREMAN.

Rainfall and sunspots, W. J. S. Lockyer (*Nature* [*London*], *68* (*1903*) *No. 1749, pp. 8–10; abs. in Science, n. ser., 18* (*1903*), *No. 446, pp. 91, 92*).—In a note in *Science* Professor Ward summarizes the author's conclusions as follows: "Smoothed rainfall curves for the British Isles, Brussels, Madras, Bombay, Cape Town, and the Upper Ohio Valley show a long-period variation at all the stations, and further, the occurrence of the greatest rainfall generally in the years 1815, 1845, and 1878–83, with the minima about the years 1825–30, 1860, and 1893–95. A continuation of the curves, based on the assumption that the apparent law already recognized holds good, indicates that the year 1913 will be at about the middle of the next wet epoch. The sunspot curve shows a close correspondence with the rainfall curves. There appears to be a long-period solar change of thirty-five years, the minimum of sunspots corresponding roughly with the maximum of rainfall. Dr. Lockyer concludes that 'since this long-period rainfall cycle synchronizes so well with the solar changes, the latter may render valuable assistance in determining the epochs of these dry and wet cycles.'" (See also E. S. R., 12, p. 724.)

Application of mathematics in meteorology, F. H. BIGELOW (*Phil. Soc. Washington, Bul. 14 (1903), pp. 215–225*).

Handbook of climatology. I, General climatology, J. HANN, trans. by R. DEC. WARD (*New York and London: The Macmillan Company, 1903, pp. XIV + 437, ill.*).—This is not only a translation but a revision of the most important part of Hann's well-known *Handbuch der Klimatologie*. The matter has been brought down to date and a larger proportion of American examples included. The changes and additions have had the approval of Professor Hann.

"The book is divided into two parts. Part 1 deals with the 'climatic factors,' namely, temperature, moisture, cloudiness, precipitation, winds, pressure, evaporation, composition of the atmosphere, and phenological observations. Part 2 deals with solar or mathematical climate, physical climate, the influence of land and water on the distribution of temperature, the influence of continents upon humidity, cloudiness, precipitation, and winds, the influence of ocean currents upon climate, the influence of forests on climate, the mean temperature of parallels of latitude and of the hemispheres, mountain climate, and finally geologic and periodic changes of climate."

WATER—SOILS.

Normal and polluted waters in Northeastern United States, M. O. LEIGHTON (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 79, pp. 192, figs. 17*).—"This paper is principally a review of the more readily available records, published and unpublished, of examinations made of water supplies derived from streams in the northeastern part of the United States, the principal streams examined being the Merrimac, Connecticut, Housatonic, Delaware, and Ohio rivers, and the various important branches of the latter in the States of Pennsylvania and Ohio. . . . The paper forms one of a series of reports on examinations made as to the character of the natural waters of the United States, and the pecuniary damage to municipal water supply occasioned by city and industrial wastes."

Waters, E. J. RUSSELL and F. T. HOLBROOK (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 143–153*).—Analyses of a large number of samples of drinking water are reported, with a brief discussion of the sources of contamination and means of detecting and preventing contamination.

Pollution of well water, K. WITTMAN (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 6, pp. 586–590, fig. 1*).

The water content of the soil on the forage plats of the Poltava experiment field, S. T. TRETYAKOV (*Pochvovedenie [La Pédologie], 4 (1902), Nos. 3, pp. 219–234; 4, pp. 378–392*).—On the basis of numerous observations made at the Poltava field during a number of years, the author arrives at the following conclusions: (1) The moisture of the soil under papilionaceous plants to a depth of 4.66 ft. is lower by 0.32 per cent than under graminaceous plants. The reverse is true of the surface soil to a depth of 2.33 ft., i. e., the grass plats contained 0.44 per cent more water than those bearing papilionaceous plants. These moisture conditions are ascribed to the unequal development of the root system of the 2 families of plants and to the difference in their yields. (2) Separate representatives of the papilionaceous and graminaceous families bear the same relation to the moisture of the soil as mixtures of a number of representatives of each of the 2 families. (3) Alfalfa fields plowed up during the fall, winter, or spring contain more moisture than those remaining under the alfalfa. This increase is noticeable in the crop immediately following and also in the next. (4) The soil under alfalfa dries up 4 times as much as that under the May fallow. (5) Under fallow as well as under cereals (summer and winter wheats) the soil dries up less rapidly than under alfalfa over one year old. (6) The moisture of the soil under alfalfa to a depth of 4.66 ft. is less than under fodder beets. The greater the age of the alfalfa the greater is this difference. (7) The younger the

alfalfa, the more humid the soil occupied by it. (8) The greater the yield of alfalfa, the drier the soil under it. (9) The unequal development of alfalfa and clover on a field depends at least in part on the inequality of the distribution of the soil moisture. (10) An increased water content in the soil occupied by alfalfa or clover furthers a good development and growth of these plants. (11) Deep plowing increases the moisture of the soil. (12) The beneficial effect of the increase of moisture due to deeper plowing is noticeable during 3 years. (13) The use of barnyard manure increases the water content of the soil, especially in its upper layers. (14) The increase of moisture in the soil from manure is noticeable even in the third year after its use. (15) Under beets there is more moisture in the soil than under barley. A like increase of moisture is noticeable in the year following the beet culture. This is one of the causes of the increased yields of alfalfa in the first years of its cultivation after beets.—P. FIREMAN.

Report of the Kherson experiment field for 1899-1900, F. B. YANOVCHIK (*Kherson, 1902, vol. 9, pp. 142; rev. in Pochvovedenie* [*La Pédologie*], *4*, (*1902*), *No. 4, pp. 433, 434*).—The most interesting experiments described in the report are those relating to the evaporation of water by summer wheat as affected by the fertilizing and the different moisture content of the soil. Some of the results are as follows: (1) In the case of a large water content in the soil tillering begins earlier than when the moisture is low, while the other phases of development set in in the converse order; (2) a high moisture content increases the effect of fertilizing; (3) the straw and the root system develop more strongly with the increase of moisture while the head becomes shorter. Regarding the amount of water evaporated per unit of crop, the following data are given: (1) When the moisture content in the soil was small (10 per cent) 500 units of water were required per unit of yield, although the presence of nitrogenous fertilizers lowered this proportion; (2) with a medium moisture content (14 per cent) of the soil the plant evaporate more water; (3) with optimum moisture (18 per cent) of the soil almost no further increase of evaporation took place, in the absence of fertilizer, but the evaporation strongly increased in the presence of nitrogenous fertilizer. The progress of evaporation during the period of vegetation was as follows: (1) In the first period of development (until the middle of May) the daily consumption of water in the vessels without fertilizer (nitrogenous) was greater than in those with fertilizer. (2) About the middle of May the fertilized wheat began to grow rapidly and overtook that without fertilizer and at the same time consumed considerably more water. (3) The maximum consumption of water took place during the last days of May. This was the period of heading and flowering. In the presence of a large store of water and fertilizer in the soil these processes continue for greater lengths of time during which the water consumption continues to be intense. (4) The increase of the consumption of water corresponds not only to the increase of the evaporating surface (corresponding to the larger growth of the plant) but also depends on the fluctuations of the temperature of the air.—P. FIREMAN.

Brack land in relation to irrigation and drainage, P. MACOWAN (*Agr. Jour. Cape Good Hope, 23* (*1903*), *No. 5, pp. 573–581*).—This article discusses the occurrence and causes of the accumulation of alkali salts in South African soils, as well as methods of freeing the soils from alkali. "The investigation of the conditions producing brack in regions like ours, of restricted periodic rainfall, as compared with those of countries with humid climate and greater precipitation, shows with great clearness that the main difficulty is presented by the back-leaching—if it may be so termed—of the limited water supply, that is, its return to the surface under the powerful influence of capillarity kept going by a heated, sun-smitten surface. Whatever perpetuates the downward creeping of the rainfall water, and stops its return upward, cures brackness radically. Toward this end there is one complete remedy, and only one—namely, a system of complete subterranean drainage."

Alkali soils, their influence on plants, and the methods of examining them, P. Kossovich (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 1, pp. 1-42*).—The author discusses the following questions: (1) What soils are to be designated as alkali soils; (2) the kinds and amounts of salts injurious to individual species of plants; (3) classification of alkali soils on the basis of the composition of the soluble salts; (4) types of alkali lands as determined by the conditions of their origin; (5) laboratory methods for the examination of alkali soils; (6) means of improving alkali soils.

The author considers the American term "alkali soils" more exact than the Russian "saline soils," as it is mainly, if not exclusively, the alkali salts which are responsible for the injurious effects observed in case of such soils.

Experiments on oats, mustard, flax, and the oak grown in pots, each containing 4,765 gm. of dry sandy chernozem soil to which were applied in addition to a basal fertilizer of 0.15 gm. of potash in form of sulphate and 0.25 gm. of phosphoric acid in form of ammonia-sodium phosphate, sodium chlorid, sodium sulphate, and gypsum each at rates of 1.5, 3, 4.5, and 9 gm. per pot. The growth of the plants during the experiments was on the whole quite normal, the oak apparently suffering more than other plants, followed by flax and mustard, and lastly by oats. The most injurious effect on the oaks was produced by sodium chlorid and was most marked in case of the three larger applications. Sodium sulphate exerted a perceptible influence only in the pots containing 4.5 and 9 gm. of the salt. Gypsum was without effect of any kind. With the other plants the most injurious effects were observed in case of sodium chlorid, the greatest injury being observed in case of flax, followed in order by mustard and oats. The yield of oats was increased in case of the smaller applications of sodium chlorid and was injuriously affected only when the proportion of this salt reached 0.194 per cent. Similar results were obtained with mustard, but the yield of flax was decreased by the presence of only 0.032 per cent of sodium chlorid. The influence of sodium sulphate was in general the same as that of sodium chlorid, although less marked. Gypsum did not exert any injurious effect.

Experiments by Loughridge (E. S. R., 13, p. 42) on the tolerance of various plants for alkali are referred to and observations on the germination and growth of wheat, oats, peas, and pine seeds in a large number of alkali soils from Turkestan are reported. As a rule the seeds failed to grow in soils containing 0.125 per cent of chlorin. The pine was able to grow in soils which contained not more than 0.039 per cent of chlorin, although it survived in soils which contained as much as 1 per cent of soluble salts. Wheat and oats grew in soils containing 2 per cent of soluble salts provided the chlorin content was less than 0.125 per cent, showing that the composition of the soluble salts is of more importance than the total quantity. No injurious effects were observed in case of gypsum.—P. FIREMAN.

Reclamation of alkali lands in Egypt as adapted to similar work in the United States, T. H. Means (*U. S. Dept. Agr., Bureau of Soils Bul. 21, pp. 48, pls. 8, figs. 6*).—This report is based on information collected during a visit to Egypt in the summer of 1902. Some of the more important pieces of reclamation work which have been undertaken in Egypt are described in detail and the methods there in use are discussed in their relation to applicability to American conditions. Notes are also given on agricultural development, climate, physiography, geology, and soils of Egypt, and on the drainage area, flow, and composition of water of the Nile.

The methods of reclamation reported to be in use in Egypt are (1) warping (*colmatage*) which affords only temporary relief; (2) flooding with open drains, which is the method in common use and thoroughly effective, but wasteful of lands and inconvenient; (3) flooding with tile drains, which has been recently introduced and is still in an experimental stage, although promising to be the most rapid and effect-

ive method. In the experiments reported the drains were laid 30 inches deep and about 35 feet apart, at a cost of $30 per acre.

The results in Egypt are held to warrant the conclusion that reclamation by drainage is entirely practicable and can be done at so low a cost "that much of the land of the West now lying idle on account of alkali or seepage water can be made to produce crops in from 1 to 3 years, with an expenditure much below the value value of the land when reclaimed." The use of tile drains is considered the most practicable method.

Humus soil, W. P. GAMBLE (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 52, 53*).—The importance of humus as a soil constituent and of methods of determining it are discussed. The following modification of the official method for determining nitrogen in soils is recommended: "In digesting, use only 3 gms. of the soil. Start with a very low flame, and allow the contents of the flask to heat for about 15 minutes. At the end of that time the danger of frothing is over, and the flame may be raised. Just raise it, however, so that the tip will barely touch the flask. Allow it to boil until the liquid is clear, or of a light straw color. Thirty cc. of concentrated sulphuric acid is all the acid needed in this digestion, and should be added to the flask at the beginning. A little pumice stone will reduce the bumping. Take care not to add any water before or during the operation."

The following method for determining moisture in humus soils is described: "Use 10 gms. of the soil. Weigh on a tared porcelain dish or watch glass (6 cm. in diameter). Place for 10 hours in a water oven, and keep it at the temperature of boiling water; also keep a constant stream of carbon dioxid passing through the oven."

Methods of maintaining the productive capacity of soils, C. G. HOPKINS (*Illinois Sta. Circ. 68, pp. 40*).—This is an address delivered before the Illinois State Farmers' Institute at Bloomington, February 25, 1903, in which the following five rules for maintaining the fertility of the soil are given and discussed:

(1) If the soil is acid or sour, apply lime to it to make it sweet; (2) if the soil is poor in nitrogen only, grow clover or some other legume which has the power to secure nitrogen from the air; (3) if the soil is poor in phosphorus only, apply bone meal or some other form of phosphorus; (4) if the soil is poor in potassium only, apply potassium chlorid or some other form of potassium; (5) always save and use all the barnyard manure you have, and also all you can economically obtain from others, and make liberal use of green manures when necessary to maintain the supply of organic matter in the soil.

The rôle of the plant in dissolving the plant food of the soil, P. KOSSOVICH (*Ann. Sci. Agron., 1902–3, I, No. 2, pp. 220–245, figs. 6*).—See E. S. R., 14, p. 427.

Soil temperatures for the year 1901, J. E. BONEBRIGHT (*Idaho Sta. Bul. 35, pp. 134, 135*).—Weekly observations at different depths at Moscow, Idaho, are reported.

Soil temperatures, C. H. MCLEOD (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 7 (1901), III, pp. 13–16, pls. 3*).

Subsoil temperatures, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 11–13, figs. 2*).—Curves show temperatures at depths of 1, 2, and 3 ft. during the growing seasons of 1901 and 1902, accompanied by data for air temperature and rainfall during the same period.

Characterization of the soil according to certain representative species of the animal kingdom, V. P. VRADI (*Selsk. Khoz. i Lyesov, 208 (1903), Mar., pp. 680–690*).—The author reviews the literature of observations which point to the fact that the presence of certain species of animals indicate soils of certain types and properties, and gives a table in which this idea is worked out in detail.—P. FIREMAN.

The new soil science, R. H. WALLACE and W. DYKE (*Jour. Roy. Hort. Soc., 27 (1902), No. 1, pp. 70–85*).—The term "new soil science" is here used "to denote the

biological and more especially the bacteriological point of view in manuring, which to a great extent is to-day supplanting the purely chemical views that have for nearly 60 years held the field." The nature and action of nitrifying and denitrifying organisms, as well as of the organisms which assimilate free nitrogen in symbiosis with leguminous plants, are discussed, and the importance of the biological processes in the soil from a practical standpoint is pointed out.

Historical review of investigations on the fixation of the nitrogen of the atmosphere by soils and plants, L. NAUDIN (*Monit. Sci., 4. ser., 17 (1903), p. 225*).

FERTILIZERS.

Experiments in green manuring, FRUWIRTH (*Mitt. Deut. Landw. Gesell., 18 (1903), Nos. 14, pp. 71–73; 15, pp. 75–77*).—In field experiments on a deep, close loam soil with medium lime content to determine the value of green manuring for hoed crops as a general practice, of different crops for the purpose, and the best means of turning crops under, it was found that the largest mass of green manuring material was furnished by field beans, followed, in declining order, by blue lupines, peas, and crimson clover. In 2 years out of 5 green manuring was followed by bad results on the succeeding crop. Green manuring crops seeded after winter wheat or as late as August 12 to 15 were of doubtful value. Phosphoric acid gave better results when applied to the green manuring crops than with the following hoed crop. Shallow plowing under of the green manures gave better results than deep.

Local deposits of bat guano, H. H. COUSINS (*Bul. Dept. of Agr. Jamaica, 2 (1903), No. 6–7, pp. 144–146*).—Analyses of 35 samples of Jamaica bat guano are reported. The average results are: Moisture, 30.9 per cent; organic matter, 33.4 per cent; nitrogen, 4.5 per cent; phosphoric acid, 5.3 per cent, and potash, 1.3 per cent. The nitrogen varied in the different samples from 0.2 to 10.5 per cent; the phosphoric acid from 0.7 to 13.8 per cent; and the potash from 0.4 to 4.7 per cent.

Hamilton sludge, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, p. 37*).—Analyses of sludge from the sewage disposal works of Hamilton, Ont., are reported. The material is shown to have about the same amounts of fertilizing constituents as ordinary barnyard manure.

Residue from the purification of sugar-beet juices, S. L. FRANKFURT (*Vyestn. Sakh. Prom., 1902, Nos. 39, pp. 467–471; 40, pp. 511–515; 41, pp. 537–540; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 6, pp. 746–750*).—An analysis of this material is reported which shows it to contain lime 42.70 per cent, magnesia 1.21, phosphoric acid 0.66, nitrogen 0.41, potash 0.30, and carbon dioxid 32.40 per cent.—P. FIREMAN.

Residue from purification of sugar beets as a fertilizer, A. CHEVELY (*Vyesnt. Sakh. Prom., 1902, No. 31, pp. 168–173; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 3 (1902), No. 6, pp. 750, 751*).—The author's experiment indicates that this material is of no importance as a fertilizer on chernozem soils, but increases considerably the yield and only slightly lowers the quality of sugar beets on sandy-clayey soils.—P. FIREMAN.

Experiments with molasses refuse on sugar beets, F. STROHMER (*Oesterr.-Ungar. Ztschr. Zukerind. u. Landw., 32 (1903), No. 2, pp. 1–31; abs. in Chem. Centbl., 1903, I, No. 23, p. 1272*).—Pot experiments are reported which indicate that the nitrogen of this fertilizer is about as effective as that of nitrate of soda and its potash as that of potassium sulphate. No injurious effect on the quality of the beets was observed in any case.

Some local refuse manures, H. H. COUSINS (*Bul. Dept. of Agr. Jamaica, 2 (1903), No. 6–7, pp. 147–150*).—Analyses with reference to fertilizing constituents are given of pond mud, banana trash ash, sheep manure, Kingston city refuse, and of a soil on which bananas had failed to grow. The soil was found to be very low in available potash.

Experiments with the Rippert manure preservative, Gerlach and Vogel (*Fühlings Landw. Ztg., 52 (1903), No. 12, pp. 409–415*).—Experiments with this preservative, the active principles of which are fluorin and sulphuric acid, are reported, from which the conclusion is drawn that manure treated with the preservative was but little more effective than that not so treated.

The action of various phosphatic fertilizers on moor meadows, Bachmann (*Fühling's Landw. Ztg., 52 (1903), No. 9, pp. 315–317*).—Comparative tests of Thomas slag, bone meal, and superphosphate are reported. The order of effectiveness was superphosphate, bone meal, Thomas slag. The superiority of the bone meal over Thomas slag is attributed to the nitrogen content of the bone.

On the value of the phosphoric acid in bone meal as plant food, H. G. Söderbaum (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 1, pp. 42–53*).—A discussion of investigations as to the fertilizer value of the phosphoric acid in bone meal, with accounts of the results of work done in this line by the author at the experiment station at Albano, Sweden. The author summarizes our present knowledge as to the value of bone meal as a phosphatic fertilizer as follows: Bone meal may under certain conditions produce nearly as good results as Thomas phosphate, or even as superphosphate, but its action can easily be reduced to a considerable extent by various factors which have little or no influence on the action of superphosphate or Thomas phosphate. The use of bone meal therefore calls for greater care on the part of the grower than the other phosphates. It can only in exceptional cases be applied to advantage on soils rich in lime. Considering present prices for phosphatic fertilizers, it is still believed, however, that bone meal can be applied economically in preference to expensive and low-grade Thomas phosphate under conditions where it will be apt to produce good results.—F. W. WOLL.

Hoof meal, E. M. Paget (*Amer. Fert., 18 (1903), No. 5, pp. 5–7, fig. 1*).—The method of preparing this material for use as a fertilizer is described.

Upon the utilization of atmospheric nitrogen ("lime nitrogen"), M. Gerlach and P. Wagner (*Deut. Landw. Presse, 30 (1903), No. 42, p. 367*).—In the preparation of acetylene gas from calcium carbid there is formed an impure calcium cyanamid mixed with carbon and caustic lime. This product contains from 15 to 25 per cent of nitrogen, which has been designated "lime nitrogen" and recommended for use as a fertilizer. Pot and field experiments with oats, barley, mustard, and carrots indicate that the nitrogen acts quickly and is almost as effective as nitrate. It was used in large amounts without injurious effect on the crops.

The potash salts, L. A. Groth (*London: Lombard Press, 1902, pp. VI + 291, figs. 62*).—This book reviews the history of the discovery and exploitation of the Stassfurt deposits; explains the formation, geology, and mineralogy of the salts; gives statistics of production and exportation, and discusses their use in industry, agriculture, and horticulture. One important section (106 pages) is devoted to descriptions and discussions of machinery used in mining the salts.

A number of experiments (mostly British) are cited to show the advantage of more liberal use of potash on various field crops and fruits. It is claimed that the amounts of potash now used for fertilizing purposes in Great Britain are not as large in proportion to phosphoric acid and nitrogen as the needs of maximum crops require. In the preface, by S. Rideal, attention is called to the importance of the increased use of potash fertilizers in British agriculture.

Phosphates and other mineral fertilizers, C. W. Hayes and E. C. Eckel (*U. S. Geol. Survey Bul. 213, pp. 418–426*).—The origin and extent of the Tennessee white phosphates are discussed and the white phosphate deposits of Decatur County are described.

Salt and gypsum deposits of southwestern Virginia, E. C. Eckel (*U. S. Geol. Survey Bul. 213, pp. 406–417*).—The location, character, and extent of these deposits are discussed.

Weight per bushel of different fertilizing materials, H. VON FEILITZEN (*Svensk Mosskult. Tidskr., 17 (1903), No. 2, p. 164*).—The following average figures were obtained by actual weighings of ordinary commercial fertilizers found in the Swedish market: Nitrate of soda 100 lbs. per bushel, ammonium sulphate 70 lbs., 20 per cent superphosphate 80 lbs., Thomas phosphate 150 lbs., kainit 100 lbs., 20 per cent potash 80 lbs., 37 per cent potash 80 lbs., muriate 75 lbs., fish guano 40 lbs., steamed bone meal 60 lbs.—F. W. WOLL.

Fertilizer inspection, C. D. WOODS (*Maine Sta. Bul. 90, pp. 25–40*).—This bulletin contains analyses of 158 manufacturers' samples of fertilizers licensed before March 1, 1903, with notes on sources of fertilizing materials, valuation of fertilizers, and the chief provisions of the Maine fertilizer law.

Analyses of commercial fertilizers, M. B. HARDIN (*South Carolina Sta. Bul. 80, pp. 26*).—This bulletin reports analyses and valuations of 177 samples of fertilizers examined during the season of 1902–3, accompanied by information regarding the valuation and composition of fertilizers and the laws and regulations relating to fertilizer control in South Carolina.

Commercial fertilizers, J. L. HILLS and C. H. JONES (*Vermont Sta. Bul. 99, pp. 51–136*).—This bulletin contains, in addition to analyses and valuations of 111 licensed brands of fertilizers representing the output of nine companies, with comments thereon, "a somewhat full discussion of several phases of the general subject of fertilization, including nitrogen, phosphoric acid, potash, lime, salt, meaning of analyses, guaranties, the valuation system, and a review of Vermont's use of fertilizers, as shown by the census returns.

"Ninety-six per cent of the brands examined met their guaranties and none failed to afford a commercial equivalent thereof. The average fertilizer contained 10 per cent more plant food than it was said to contain. The quality of the crude stock used was found to be as a rule above reproach. The average selling price was $28.25, the average valuation, $18.59.

"Vermont uses half a million dollars' worth of commercial fertilizers annually. The 'east side' uses three-fifths of this amount. The fertile Champlain Valley soil and the more intense dairy husbandry of the 'west side' are probably factors in this matter."

Manures, E. J. RUSSELL and F. T. HOLBROOK (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 108–129*).—Analyses of the following fertilizing materials available for use in England are reported and discussed: Barnyard manure, guanos (nitrogenous, phosphatic, ichaboe, meat, and fish), sewage sludge, rape-oil residue, cotton-seed cake, husks of coffee berries, malt dust, bone, basic slag, superphosphate, greaves, silk waste, horn shavings, carpet waste, cloth cuttings, shoddy, wool waste, wool dust, hair, hair and wool, hair waste, horse hair, calf hair, American rabbit waste (fur, etc.), fur waste, leather waste, rags (linen, silk, and flannel), flock dust, leather dust, nitrate of soda, sulphate of ammonia, kainit, and lime ashes.

FIELD CROPS.

Report of the experimentalist, C. A. ZAVITZ (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 105–138*).—The experiments here reported consisted largely of variety and culture tests, which have mostly been in progress for some years (E. S. R., 13, p. 1032). The work of the season is reviewed in general, and the improvement of seed selection as indicated by the results of experiments is discussed.

For 6 years oats, spring wheat, barley, and peas have been grown separately and in various combinations for the production of grain and straw. Taking the average of 3 years with mixtures of oats and barley, the greatest yields of grain were as follows: 1 bu. of oats and 1 bu. of barley, 2,201 lbs.; 1 bu. oats and 1½ bu. barley, 2,178 lbs.; 1 bu. oats and ½ bu. barley, 2,161 lbs. per acre. These mixtures and the

mixtures of 1½ bu. oats and 1½ bu. barley also produced the best average yields of straw. In 1902 a mixture of 1 bu. of oats and 1½ bu. of barley was compared with several mixtures containing the same quantities of oats and barley, and in addition ½ bu. of either Wild Goose spring wheat, emmer, grass peas, or flax. The experiment was conducted in duplicate and the average yield of oats and barley was 2,183 lbs.; of oats, barley, and spring wheat, 2,273 lbs.; of oats, barley, and emmer, 2,207 lbs.; of oats, barley, and grass peas, 2,159 lbs.; and oats, barley, and flax, 2,180 lbs. per acre. In 1 test equal quantities of seed of 12 different farm crops were sown to determine how these crops would stand crowding. Beginning with the largest yield of grain, the crops stood in the following order: Manshury barley, Joanette oats, Black Hulless barley, Siberian oats, rye, White Hulless barley, emmer, Wild Goose spring wheat, Prussian Blue peas, flax, grass peas, and common vetches.

The results of treating oats and winter wheat for the prevention of smut are reported. Untreated seed oats produced 5½ per cent of smut in the crop. The hot water and formalin treatments were very effective. The average results for 4 years show that untreated winter wheat contained 456 smut balls per pound of wheat; treated with potassium sulphid, 11; with copper sulphate, 2; and with hot water, 1.

A comparison of leading varieties of different field crops grown under similar conditions was made and the results are given in the following table:

Comparative tests of ten different field crops.

Varieties.	Date of ripening.	Average height.	Amount lodged.	Amount of rust.	Yield of straw per acre.	Yield of grain per acre.
		Inches.	*Per cent.*	*Per cent.*	*Tons.*	*Pounds.*
Emmer	Aug. 12	35	1	1	1.7	2,334
Joanette oats	Aug. 7	35	1	5	1.5	2,217
Manshury barley	July 30	35	3	2	1.3	2,113
Wild Goose spring wheat	Aug. 25	42	1	2	1.8	1,853
Black Hulless barley	July 29	28	9	3	1.2	1,825
Alaska oats	July 30	37	2	4	1.3	1,783
White Hulless barley	July 29	28	12	4	1.1	1,541
Spring rye	Aug. 12	48	0	2	1.6	1,364
Prussian Blue peas	Sept. 2	52	0	0	2.5	1,279
Common vetches	Sept. 3	41	0	0	2.0	1,040

The results obtained with these same crops in cooperative tests throughout Ontario show that the comparative order in yield of grain is very similar to that in the above test.

Red Fern and Red Fife spring wheat were found to be among the best varieties for the production of flour. The average of 10 years' results with macaroni wheats gave the following yields: Wild Goose 38.4 bu., Medeah 33.8 bu., Bart Tremenia 33.4 bu., Sorentina 33 bu., Algiers 31.4 bu., and Ontario 20.9 bu. per acre. For general cultivation in Ontario Wild Goose is considered the leading variety.

Descriptions of spelt and emmer are given and the results of culture tests are reported. The following yields of varieties of spelt were obtained in 1902: Red spelt 1,661 lbs., Alstroum 1,466 lbs., German spelt 1,420 lbs., White Summer spelt 1,263 lbs. of grain per acre. Emmer has been under test for 3 years, and has given an average yield of grain per acre of 2,327 lbs. The weight per measured bushel for the 3 years varied from 33.8 to 43.8, with an average of 38 lbs. Emmer gave better results than spelt in an experiment at the college, and it is believed that this crop will be more generally grown for feed for live stock. The results of variety tests with spring rye, oats, 6-rowed barley, 2-rowed barley, Hulless barley, winter barley, winter wheat, winter rye, buckwheat, and corn are reported. Dakota Mammoth, Prolific Spring, Common, and Colorado Giant spring rye grown from 3 to 5 years yielded on an average 40.2, 36.9, 34.9, and 25.8 bu. per acre respectively. In 1902, 72 varieties of oats were under test. Some of these varieties have been grown for

12 to 14 years in succession. The average yield for 12 years of Siberian oats was 88.6 bu. per acre, and of American Banner, 84.7 bu. Oderbrucker, Probsteer, Waterloo, and Bavarian have also given good average results for a series of years. Of oats, 22 varieties, mostly imported, were grown for the first time this year, but none equaled Siberian nor American Banner in yield. The best yielding varieties of 6-rowed barley in 1902 were as follows: Manshury 86 bu., California Brewing 80 bu., Common Six-Rowed 77 bu., and Oderbrucker, 75 bu. per acre. Of 10 varieties grown for 9 years in succession the greatest yields in the order given were produced by Manshury, California Brewing, Scotch Improved, Common Six-Rowed, and Oderbrucker. Among 8 varieties of 2-rowed barley tested for 9 years, French Chevalier and New Zealand Chevalier, with an average yield of 62 bu. per acre, were the leaders. Of hulless barley 11 varieties were tested this season, and of these, 8 under test for 9 years have given the following average results: Guy-Mayle 48 bu., Black Hulless 45 bu., Purple 44 bu., Guymalaya 42 bu., Winnipeg No. 2 41 bu., Hungarian 41 bu., Large Skinned 40 bu., and Smooth Hulless 38 bu. per acre. With winter barley the experience has been that the crop usually winterkills in unfavorable seasons, but that it gives exceedingly good yields when the winters allow it to survive.

Of 95 varieties of winter wheat grown this season Extra Early Windsor, Dawson Golden Chaff, Imperial Amber, Pedigree Genesee Giant, Prize Taker, Economy, New Columbia, White Golden Cross, Early Ontario, and Johnson, in the order mentioned, gave the highest yields. Dawson Golden Chaff, Extra Early Windsor, Clawson Longberry, and American Bronze possess the stiffest straw. Among the red wheats, Michigan Amber and Turkey Red, and among the white varieties, Early Genesee Giant and Bulgarian are considered good milling wheats.

The average yields obtained by sowing 1, 1½, and 2 bu. of winter wheat per acre for 6 years were 40.2, 43.3, and 43.9 bu. per acre, respectively. Drilling and sowing broadcast have given practically the same results. The average results of experiments for 8 years favor sowing winter wheat the last week of August or the first week of September. For 4 years, field peas as a green manure, have given an annual average of 22.1 per cent more wheat than buckwheat used in the same way. Winter wheat after clover, in a 1-year test, yielded 20.7 per cent more grain than when grown after timothy. The average results of experiments in progress for 7 years to determine the value of seed from wheat cut at different stages of maturity show that the heaviest grain and the largest total yield were produced from seed taken from very ripe crops. The average yields of winter rye for 4 years were as follows: Mammoth 57.4 bu., Monster 54.9 bu., and Common 52 bu. per acre. The variety tests of buckwheat show that on the average for 7 years Japanese has given 20.8 bu. per acre, Silver Hull 17.8, and Common Grey 16. In the yield of straw these varieties stood in the same order.

Of 19 early varieties of flint and dent corn grown in 1902 the following in the order given led in productiveness: Dakota Gold Dollar, Longfellow, Farmers' Friend, Baily Mahogany, and Canada Yellow. The best average yields for 3 years were as follows: King Phillip 64.2, Genesee Valley 62.7, North Star Yellow Dent 61.1, Pride of Canada 59.9, and Longfellow 58.9 bu. per acre. The percentage of cob to ear in the different varieties showed wide variations.

The 3 best kinds of sunflowers under test for 5 years and the average yields of seed per acre were White Beauty 66.3, Mammoth Russian 64, and Black Giant 57.5 bu. per acre. In 1902 the yields were 80.9, 60.7, and 67.5 bu. per acre, respectively. California and Siberian varieties of millet have given the best yields of seed for a series of years.

Field peas planted as late as June 25 did not escape the ravages of the pea weevil. The culture and uses of the grass pea are described and the results of culture tests reported. The plant is considered good for forage, but as not replacing the garden

peas for table use or the field peas for export. For 7 years the average annual yield of grain of the grass pea has been 25.7 bu. and the yield of straw 2.7 tons per acre. The yields also compared very well with the yields of vetch. The chick pea (*Cicer arietinum*) has given an average yield of 35.6 bu. of grain and 1 ton of straw per acre. In a cooperative test of 4 years the average annual yield of 180 successful experiments was 21.1 bu. of grain per acre. Cowpeas did not generally mature at the college. Neither did lupines, lentils, and horse beans give very satisfactory results.

Vetches grown for seed produced a little more than 7 bu. per acre from fall seeding. This return is considered profitable, as the seed sells at from $5 to $7 per bushel.

The average results for 6 years show that the following varieties of field beans have given the highest yields: White Wonder, Day Improved Leafless, Medium or Navy, Pearce Improved Tree, and Schofield Pea. Based on the experiments with soy beans at the college, the Early Yellow is recommended for the production of grain for feed, and the Medium Green for ensiling with corn.

Of flax, 3 varieties grown in 1900 gave the following results: Manitoba 16.8, Common 15.7, and Russian 10.5 bu. of seed per acre. The average yields for the number of years these varieties have been grown are 13, 11.4, and 10.8 bu. per acre, respectively.

This season 124 varieties of potatoes were under test. The following varieties lead in yield: Empire State, Molly Stark, White Elephant, Conroy, Rural New Yorker No 2, The Daisy, Rose New Invincible, Uncle Sam, Salzer Earliest, New Queen, and Carman No. 1. Of 21 varieties grown for 9 years the following lead in average production: Empire State 244, Convoy 242, Rose New Invincible 241, Rural New Yorker No. 2 234, and American Wonder and White Elephant each 232 bu. per acre. Empire State was found to be one of the best varieties for table use. An experiment to show the varieties producing the largest average yields 9, 12, and 15 weeks after planting is reported. In selecting seed potatoes it has been found that large potatoes or large pieces of potatoes produce greater yields than either small potatoes or small pieces. The results of planting 1, 2, and 4 pieces per hill, using equal weight of seed are in favor of planting 1 piece, both in total yield and in percentage of marketable potatoes. Coating potato sets by sprinkling them with lime and plaster increased the yield at the college and in cooperative experiments throughout Ontario. It is shown by tests that it is best to plant potato sets immediately after they are cut. A fertilizer experiment with potatoes conducted in duplicate gave the following average results: No manure 105 bu., 5 tons barnyard manure per acre 144 bu., 1 ton of poultry manure per acre 125 bu., and 2 tons of poultry manure per acre 158 bu. The use of a corrosive sublimate solution was effectual in reducing the amount of scab in potatoes grown from scabby potatoes. Different methods of combating the potato beetle are reported.

The yields of varieties of sugar beets grown for feed are tabulated. The average yields for 9 years were as follows: Red Top 19.7, White Silesian 19.3, Lane Improved 19.3, Champion 18.6, White French 17.5, Red Skinned 16.4, Kleinwanzlebener 16.3, and Improved Imperial 14.3 tons per acre. The results of distance experiments in this connection show that as the distance between the rows increased the average size of the roots increased and the yield decreased. Extensive experiments made in past years have shown that the following are among the leading varieties of root crops for field culture: Swedish turnips—Sutton Magnum Bonum, Improved Purple Top Yellow, Buckbee Giant, Hartley Bronze Top, and Kangaroo; fall turnips—Red Top, White Globe, Cow Horn, and Jersey Navet; mangels—Yellow Leviathan, Sutton Mammoth Long Red, Evans Improved Mammoth Sawlog, and Steele Long Red Selected; carrots—Mastodon White Intermediate, Mammoth Intermediate, Smooth White, and Pearce Improved Half Long White; parsnips—New Ideal, Hollow Crown, and Improved Half Long.

For a series of years large seed of root crops has given better yields than medium and small-sized seed. Whole seed of mangels and sugar beets produced a greater

yield than a similar quantity of broken seed. An experiment conducted this season resulted in the best yields of sugar beets and carrots when the seed was planted only ½ in. deep. Level culture is reported as having given better yields of sugar beets than ridge culture. A mixed fertilizer, consisting of 52¼ lbs. each of nitrate of soda and muriate of potash and 106⅔ lbs. of superphosphate, increased the yield of Swedish turnips about 4 tons per acre, at a cost of about $1 per ton.

In a test of 135 varieties of corn grown for fodder or silage New Delaware Dent and Pedrick Perfected Golden Beauty gave the greatest total yields, being 24 and 23.8 tons per acre, respectively. The greatest yields of husked ears were produced by Golden Leneway Dent, Snow White Dent, and Black Mexican Sweet corn, the yields being 4.3, 4.3, and 4.2 tons per acre, respectively. Salzer North Dakota, Compton Early, and King Phillip, flint varieties, and North Star Yellow Dent, a dent variety, are recommended for central and southern Ontario. An average of 4 years' tests from planting at different depths gave the following total yields: 2 in., 13.2 tons; 1½ and 3 in., each, 11.8 tons; 1 in., 11.7 tons; ½ in., 10.6 tons; and 4 in., 9.8 tons.

Other forage crops under test were millet, rape, sorghum, grasses, and clovers. The average yield of green crop per acre for 8 years for Golden Wonder, Holy Terror, Gold Mine, Japanese Panicle, Japanese Barnyard, and Magic varieties of millet was 11.6, 11.4, 10.4, 10.3, and 10.3 tons per acre, respectively. The results of an 8-year test with rape show that Dwarf Essex and Dwarf Victoria yielded 23.4 and 21.8 tons of green fodder per acre. Buckbee Wonderful Bonanza rape, grown for the first time, gave a satisfactory yield.

The average yields of 16 varieties of sorghum, including sugar cane, broom corn, Kafir corn, millo maize, Jerusalem corn, etc., under test for 3 years are tabulated. Early Minnesota sugar cane has given the highest average yields of green fodder per acre. Of 16 different leguminous forage crops, hairy vetch led in the production of green fodder, with an average yield for 2 years of 13.9 tons per acre. The yields of all the crops are recorded.

The following mixtures of annual crops are recommended for pasture: Oats, hairy vetches, and Early Amber sugar cane; spring rye, hairy vetches, and Hungarian grass; and barley, crimson clover, and Early Amber sugar cane.

For permanent pasture the following mixture of grasses and clovers has given the best results in several years' experiments: Orchard grass 4 lbs., meadow fescue 4 lbs., tall oat grass 3 lbs., timothy 2 lbs., meadow foxtail 2 lbs., alfalfa 5 lbs., alsike clover 2 lbs., white clover 1 lb., and trefoil 1 lb., making a total of 24 lbs. of seed per acre.

Among the mixtures of grasses and clovers for hay tested for several years, tall oat grass and alfalfa; tall oat grass, orchard grass, Mammoth red clover, and alfalfa; and timothy and alfalfa have given the best results, the yields of hay being 3.2, 3.1, and 3.1 tons per acre, respectively. The best yields in 1902 were produced by timothy with Mammoth red clover, tall fescue with Mammoth red clover, tall oat grass with Mammoth red clover, and orchard grass with Mammoth red clover. Cereal crops after clover gave on an average for 3 years, 833 lbs. of grain more per acre than the same crops grown after grass.

A rotation study, F. S. Shiver (*South Carolina Sta. Bul. 79, pp. 62*).—The object of the experiments here presented was to ascertain the effects of different rotations on the composition of the soil, and whether or not there is any relation between the amounts of phosphoric acid and potash removed by the crops and the amounts of these constituents shown to have been removed from the soil by the present methods of analysis. The work was conducted on 24 plats, 12 of which received 200 lbs. each of cotton-seed meal and acid phosphate and 100 lbs. of kainit per acre and the rest no fertilizer at all. Cowpeas were removed from the fertilized plats, but were plowed under on the plats receiving no fertilizer. A 3-year rotation was practiced, and the soil and subsoil of each plat was analyzed before and after the experiment. The

composition of the annual crops was also determined and all results are here reported in tables.

A loss of humus was found to have taken place in a large number of fertilized and unfertilized plats, this loss being especially evident on the plats on which cotton was grown continuously. The maintenance of the supply of humus in the soil was fully as good on fertilized plats with only the roots and stubble of cowpeas turned under as on the unfertilized plats on which the whole growth of the cowpeas was turned back to the soil. On 13 of the plats a more or less close agreement between the yields of wheat in the fourth year and the losses and gains of nitrogen, humus, and humic nitrogen was observed, while in the other cases the results appeared contradictory.

With reference to the relations between the quantities of phosphoric acid and potash removed by the crops and the quantities shown to have been removed from the soil by the present methods of analysis, the author concludes from the data that none of the methods employed give absolutely reliable results for available phosphoric acid and potash, and he believes that field experiments are much less adapted to the solution of the question than pot experiments, because the conditions can be better controlled in the latter.

Culture trials on Swedish moor soils, 1900-1902, H. von Feilitzen (*Svensk Mosskult. Tidskr., 17 (1903), No. 2, pp. 105–135*).—Accounts of a number of different experiments conducted by the Swedish Moor Culture Association during the years are given. The experiments include trials on moor soils with oats and barley, as to time of sowing and size of seed grain; inoculation experiments with soils and pure cultures of bacteria from legumes; green manuring; and tests of the value of barnyard manure with peat litter, straw, or shavings used for bedding, etc.—F. W. WOLL.

Continuous culture without manuring for 75 years, W. Christiani (*Deut. Landw. Presse, 30 (1903), Nos. 26, pp. 217, 218; 27, pp. 226, 227; 28, p. 236*).—On the humus alluvial soil on which these experiments were conducted good yields of cereals were obtained after 75 years continuous culture. The soil, however, had become "beet sick."

Growing and preparing agricultural crops for exhibition, B. C. Buffum and A. Nelson (*Wyoming Sta. Bul. 58, pp. 12*).—This bulletin gives detailed directions for the growing and preparation of grains, grasses, vegetables, and fruits for exhibition purposes. Suggestions for the selection of specimens and their exhibition are given, and the methods of labeling them are presented.

Cassava, S. M. Tracy (*U. S. Dept. Agr., Farmers' Bul. 167, pp. 32, figs. 11*).—The varieties of cassava are described, the history of the plant briefly noted, and the region suited to its culture shown on a map. The soil and moisture requirements and the climatic conditions suitable for the growth of the crop are discussed, and directions for the use of fertilizers, preparation of the ground, and planting, cultivating, harvesting, and storing the crop are given. Diseases attacking the plant and preventive measures for the same are noted. The yields and profits of cassava culture are estimated and the uses of the crop as a feed for cattle, hogs, and poultry, and its value for the manufacture of starch are pointed out.

Selecting and preparing seed corn, P. G. Holden et al. (*Iowa Sta. Bul. 68, pp. 273–286, figs. 11*).—This bulletin gives information regarding the purchasing and testing of seed corn and its preparation for planting. The importance of planting a uniform number of kernels per hill is dwelt upon and it is recommended that the planter used should drop 93 to 96 times out of a hundred the number of kernels desired. Planter tests showing the number of kernels dropped when they were uniform and unequal in size are reported. When uniform-sized kernels were used the planter in one test dropped 2 kernels 8 times and 3 kernels 92 times out of a hundred. With kernels irregular in size the number of times 1, 2, and 4 kernels

were dropped per 100 was largely increased. Methods of selecting seed corn and making germination tests are described, and a score card for corn with an explanation of the points is presented.

Cotton culture in Servia, V. I. MASALSKI (*St. Petersburg: Min. Agr. and Imp. Domains, Dept. Agr., 1902, Nos. 45, 46; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, p. 235*).—Experiments are in progress to determine whether or not cotton can be profitably grown in Servia. Thus far American cotton from Turkestan seed has given the best results, while Egyptian and Sea Island varieties were the least promising. Owing to the climatic conditions of the country the results were not encouraging. Further experiments are considered necessary for definite conclusions.—P. FIREMAN.

Forage crops, B. C. PITTUCK (*Texas Sta. Bul. 66, pp. 16, figs. 6*).—This bulletin discusses the value and importance of alfalfa, peanuts, velvet beans, millet, and rape for forage and presents the experience of farmers with reference to the growth and adaptability of these various crops. The directions for the culture and uses of forage crops are largely based on the results obtained at other experiment stations. The larger portion of the bulletin is devoted to alfalfa.

At the station alfalfa seed from Utah and seed obtained in Texas gave practically equal yields the first year, but the second season the Utah-grown seed produced 2,071 lbs. of hay more per acre than the other.

Some experiments on the ensiling of grass and beets, L. BAUWENS (*Jour. Soc. Cent. Agr., Belg., 50 (1903), Nos. 5, pp. 200, 201; 6, pp. 229, 230*).—Brief notes on simple methods of ensiling in pits, trenches, etc.

The cowpea and soy bean in Illinois, D. S. DALBEY (*Illinois Sta. Circ. 69, pp. 15, figs. 5*).—The value of cowpeas and soy beans for Illinois is discussed and the results of variety tests of the 2 crops are reported briefly. Popular directions for the culture of the crops are given and their feeding and fertilizing value are pointed out. Drilling about $\frac{1}{3}$ bu. per acre in rows 32 in. apart is considered best for the production of seed. Among 22 varieties of cowpeas grown at the station Warren Extra Early and Warren New Hybrid were the most prolific varieties, yielding 38.7 and 38.3 bu. per acre, respectively. Whippoorwill, which is very commonly grown, yielded only 15.6 bu. per acre in this test. A comparative test was made of 8 varieties of soy beans. Medium Green headed the list with a yield of 41.7 bu. per acre, followed by Early White with a yield of 38.2 bu. Late Mammoth did not mature seed.

Further experiments in top-dressing grass land, H. J. WHEELER and G. E. ADAMS (*Rhode Island Sta. Bul. 90, pp. 69–86, figs. 4*).—This work is in continuation of experiments previously reported, and a description of the plats and their treatment has been given in a former abstract (E. S. R., 14, p. 32). This bulletin is mainly devoted to the results of the fourth year.

The plat receiving the full application of 63 lbs. of nitrogen per acre in the form of nitrate of soda yielded 3.4565 tons of hay per acre in 1899, 4.1 tons in 1900, 4.695 tons in 1901, and 4.1 tons in 1902, the value of the hay exceeding the cost of the fertilizers by \$19.62 per acre the first year, \$30.40 the second year, \$40.70 the third year, and \$32.74 the fourth year. The total excess in the value of hay over the cost of fertilizers for the 4 years was \$123.46 per acre, or an average of \$30.87 per acre for each year. The use of the full application of nitrogen gave much greater financial returns than the use of one-third of the application or the total omission of the same. In 1901 and 1902 the losses in weight of hay during storage ranged from 13.3 to 19.6 per cent.

Redtop, grown on the same area and at the same time as timothy, was richer in nitrogen and also contained more silica, lime, magnesia, phosphoric acid, and potash than the timothy, but a greater percentage of nitrogen in the timothy than in the redtop had been changed to albuminoids. The amounts of plant food furnished by the fertilizers and removed by the crops are given as follows:

Plant food furnished per acre in the fertilizers and removed by the crops.

Fertilizer.	Plat 17, no nitrogen.		Plat 19, one-third ration of nitrogen.		Plat 21, full ration of nitrogen.	
	Quantity in fertilizers.	Quantity in crops.	Quantity in fertilizers.	Quantity in crops.	Quantity in fertilizers.	Quantity in crops.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Nitrogen	0.00	40.01	21.00	33.56	63.00	49.70
Potash	150.00	47.87	150.00	55.64	150.00	123.35
Phosphoric acid	130.00	10.78	130.00	13.30	130.00	25.58

Plant food removed per 1,000 lbs. of field-cured hay in 1901–2.

Fertilizer.	Plat 17, no nitrogen.		Plat 19, one-third ration of nitrogen.		Plat 21, full ration of nitrogen.	
	1901.	1902.	1901.	1902.	1901.	1902.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Nitrogen	6.5	13.6	5.6	6.9	5.8	6.1
Potash	14.9	16.2	14.7	11.5	16.2	15.0
Phosphoric acid	4.1	3.9	3.5	2.7	3.3	3.1

From the results of all the experiments up to date it is concluded that an application of 400 lbs. acid phosphate, 200 to 250 lbs. muriate of potash, and 350 lbs. nitrate of soda per acre would probably have given better net returns than the quantities employed in this experiment. "Top-dressing 'run out' land which is not filled with the proper kinds of grass roots" is considered a waste of the fertilizer. For such grass lands plowing and reseeding heavily is recommended.

Flax and flaxseed selection, H. L. Bolley (*North Dakota Sta. Bul. 55, pp. 171–186, figs. 8*).—This bulletin reviews flax culture in the United States and other countries, contrasts European and American conditions with reference to the culture of the crop, and summarizes the difficulties affecting the flax industry in this country. In discussing flax culture in North Dakota the author points out the use of mixed seed of poor quality, poor soil culture, and the lack of proper crop rotation as unsatisfactory practices, and outlines methods of procedure to improve the culture of flax in general and to obtain more profitable results.

Influence of kainit on the yield of flax, A. Alexandrov (*Dokl. i Soobshch. 2. Syezda Dyegat. Selsk. Khoz. Opuitn. Dyelu, St. Petersburg, 1902, pt. 1, pp. 104–110; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 1, p. 93*).—In experiments conducted at the Vyatka Experiment Station and the Okunyen Farm kainit increased the yield of the seed as well as the straw of flax, the proportion of increase being the greater in the straw. The increase in the yield of straw was partly due to the increase in the length of stem.—P. FIREMAN.

Pearl millet, C. R. Ball (*U. S. Dept. Agr., Farmers' Bul. 168, pp. 16, figs. 3*).—This bulletin gives a description of pearl millet with directions for its culture and uses. The origin and history of the plant are reviewed and the different names applied to it are pointed out. A test of seed sold under the different names showed the resulting plants to be practically identical. The uses of the crop for soiling, ensilage, and hay are briefly noted. The composition of pearl millet cut at different stages of growth, as determined at different experiment stations, is compared with the average analyses of cured corn stover and corn fodder, and of sorghum used as green fodder.

The anatomical structure of cultural varieties of millet, A. L. Winton (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6* (*1903*), *No. 8, pp. 337–345, figs. 8*).—On the basis of microscopical studies the author discusses the anatomical structure of sorghums, broom corn, Kafir corn, etc., and related topics.

The ash constituent of potato leaves at different stages of growth and under different systems of fertilizing, J. Seissl (*Ztschr. Landw. Versuchsw. Oesterr.,*

6 (1903), No. 5, pp. 537–554).—The mineral constituents at five different stages of growth of leaves of potatoes grown without fertilizers and with applications of kainit, superphosphate, and a mixture of kainit and superphosphate are reported in detail. The results show that fertilizing with kainit in connection with superphosphate often caused, in some cases a direct and in other cases an indirect increase of the lime and magnesium content of the leaves. The maximum content of the potash and phosphoric acid was observed about the first of July, and also about the time of blooming. In the case of other constituents the maximum content was always observed at a later period. The ratio of phosphoric acid to potash was on the average about 1:3–4. The proportion of magnesium oxid to calcium oxid was on the average of 1:2.6–2.9. This relation varied very slightly with different systems of fertilizing and periods of growth.

Modern rice culture, W. J. Boudreau (*Philippine Bureau Agr., Farmers' Bul. 3, pp. 46, figs. 16*).—This is a popular bulletin discussing methods of rice culture as adapted to the Philippine Islands. The subject matter is presented in English and in Spanish. The topics discussed are the soil and its preparation, together with the construction of ditches and levees, the planting of rice, the treatment of the crop, its drainage and irrigation, and the methods of harvesting and thrashing. The application of fertilizers is briefly explained and short notes on varieties of rice are given.

The influence of soil and climate upon the composition of the sugar beet, 1901, H. W. Wiley (*U. S. Dept. Agr., Bureau of Chemistry Bul. 74, pp. 42, charts 3*).—The experiments here reported have been previously described and the data obtained in 1900 have been given in a former bulletin (E. S. R., 13, p. 736). The results here shown were derived in the same manner as those of the previous year. In addition to these data the analyses of the soils upon which the experiments are in progress are given. The average results for the season are summarized in the following table:

The average results with Dippe Kleinwanzlebener Elite sugar beets grown under different conditions of soil and climate in 1901.

Locality.	Analytical data.			
	Weight.	Yield per acre.	Sugar in the beet.	Coefficient of purity.
	Ounces.	*Tons.*	*Per cent.*	
Washington, D. C	7.9	8.1	8.5	67.3
Lexington, Ky	10.4	8.0	9.0	71.0
Madison, Wis	10.9	11.0	12.7	77.4
Blacksburg, Va	4.5	10.0	13.1	77.6
Ames, Iowa	14.2	12.9	14.1	80.2
Logan, Utah	24.2	23.4	14.2	79.1
Agricultural College, Mich	8.3	10.2	14.6	81.5
Lafayette, Ind	8.2	5.4	14.6	82.5
Ithaca, N. Y	13.1	12.6	14.6	79.9
Geneva, N. Y	17.2	13.8	15.8	83.9

Locality.	Meteorological data; May to October.			Geodetic data.		
	Temperature.	Precipitation.	Sunshine.	Average length of day.	Latitude.	Altitude.
	Degrees.	*Inches.*	*Per cent.*	*H. M.*	° ′ ″	*Feet.*
Washington, D. C	69.0	19.34	64.00	14 23	38 53 23	37.5
Lexington, Ky	69.3	16.23	75.00	14 18	38 02 25	979.0
Madison, Wis	65.6	14.33	....	14 44	43 04 36	955.0
Blacksburg, Va	63.8	32.08	53.70	14 14	37 14 00	2,100.0
Ames, Iowa	67.9	16.15	69.85	14 38	42 02 00	917.0
Logan, Utah	64.0	7.37	76.30	14 37	41 44 00	4,500.0
Agricultural College, Mich	62.8	19.84	61.80	14 42	42 45 00	847.0
Lafayette, Ind	68.6	16.41	69.85	14 30	40 23 00	542.0
Ithaca, N. Y	63.4	17.44	66.00	14 41	42 27 00	810.0
Geneva, N. Y	65.5	18.03	66.00	14 44	42 53 00	453.0

In several instances the meteorological data in the above table are taken from the records of the station nearest to the locality recorded. The analytical data shown from Layfayette, Ind., are based on one sample only; and the mean weight of topped beets with the estimated yield reported from Agricultural College, Mich., represents the average of early and late planting. As in the previous year, the results in general show that the sugar content varies with the latitude. The percentage of sunshine seems to have but little effect upon the percentage of sugar in the beet and the actual predominance of clear days, in so far as it does not indicate drought, is not regarded as an important factor. The percentage of sugar was found to increase with the length of the day, and attention is called to the fact that these results coincide with the theory of the correlation of the functional activity of the chlorophyll cells and the light of the sun. The data with reference to the relation of temperature to sugar content show more irregularities than those representing latitude and length of day, still they indicate the tendency of the sugar to diminish as the temperature increases. A striking effect of altitude upon the composition of the beet is shown in the data obtained at Blacksburg, Va., and at Washington, D. C. Blacksburg, with the lowest latitude, shows almost the average sugar content produced at the other stations, while Washington, with a low latitude and the lowest altitude, gives the lowest percentage of sugar. As an illustration that altitude does not in every case tend to increase the content of sugar the author cites the results obtained at Geneva and Ithaca, N. Y., during the two seasons covered by the experiments, which show that although Geneva is almost 400 ft. lower than Ithaca the beets produced there were higher in sugar content. With reference to rainfall, it is concluded that the actual amount does not have as great an influence on the composition of the beet as does its distribution.

Sugar-beet experiments, 1902, C. D. SMITH (*Michigan Sta. Bul. 207, pp. 63–75*).—The work with sugar beets in 1902 was largely in continuation of experiments reported in former bulletins of the station (E. S. R., 14, p. 244). The results of analyses of sugar beets by the station chemist for the years 1897 to 1902, inclusive, are tabulated. From these results the author concludes that it is practicable to grow beets rich in sugar in all parts of the State, but in general the beets are richer in sugar the farther north they are grown.

Twenty-four varieties were tested at the station and on 2 different farms. The results of germination tests of the seed of the different varieties showing the number of sprouts from 100 fruits in 7 and 14 days and the total number for the entire period are reported. The data obtained in connection with the variety tests show that individual beets from the same plat vary as widely in sugar content as samples from different plats. With these facts in view the author calls attention to the inability to secure representative samples and dwells upon the consequent unreliability of tables comparing different varieties, and of the inaccuracy of paying for beets according to the sugar content of samples taken at the factory. On one of the farms the beets were grown on a low, wet, mucky soil; still, the average sugar content in the samples of the different varieties was higher than at the station and at the other farm. Owing to a wet season no conclusions as to the adaptation of the different varieties to various soils and conditions are drawn. The yields of beets and the yields of sugar, based on the sugar content of the samples analyzed, are tabulated. Cooperative experiments with this Department to determine the value of Bordeaux mixture for the prevention of the leaf blight were ruined by frequent rains.

The results of distance experiments show that the average yield of beets and the sugar content did not vary greatly for the several distances, 16, 18, 20, and 22 in. between rows. Where the beets were grown in rows 2 ft. apart a slight decline in the yield was noticeable, but there seemed to be no decrease in the sugar content. As in a previous report it is again recommended that the rows be placed 21 in. apart.

A report of progress on an experiment to test the exhaustion of the soil by beets is presented. The tabulated results show a significant reduction in the yields of oats, beets, and corn on plats which had produced beets 2 and 3 years in succession followed by 1 year of oats. Cooperative work with this Department in the production of beet seed is also in progress.

Sugar beets in the Upper Peninsula, C. D. SMITH and L. M. GEISMAR (*Michigan Sta. Spec. Bul. 18, pp. 8*).—This bulletin reports the results of culture tests with sugar beets in the Upper Peninsula of Michigan. This is the first season's work and no conclusions are drawn.

Attention is called to the fact that from April 15 to October 15 the sun is above the horizon for 69.13 hours longer at 47° north latitude than at 42°, and this is considered a dominant influence on the sugar content of beets grown at the higher latitude. The beets in the samples sent to the college for analysis dried out considerably and hence the results are inaccurate. An experiment was made by the station chemist to determine the loss of weight in beets subjected to conditions similar to those of the samples sent to the college, which were in transit for 3 days. The loss of weight varied from 16.8 to 21.6 per cent, the sugar content in the juice before drying from 14.68 to 16.6 per cent, and after drying from 18.6 to 20.9 per cent.

Sugar-beet experiments, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 42–47*).—A report is given on testing sugar beets grown for feeding and for factory purposes. The beets grown for feed, judged by their sugar content, were all excellent for the purpose. They were cultivated in general as other root crops grown for forage.

The results of cooperative tests of sugar beets to demonstrate the possibility of producing beets for the manufacture of sugar are presented. The average results obtained in 6 districts in 1902 by 189 experimenters show 16 per cent of sugar in the juice with a purity of 88.1; in 1901, the average of 15 districts with 335 experimenters was 16.4 per cent of sugar in the juice with a purity of 87.5; and in 1900 the average of 3 districts with 116 experimenters amounted to 14.4 per cent of sugar in the juice with a purity of 85.4. In connection with this work several fertilizer experiments were conducted. The use of Thomas slag apparently increased the average weight of the beets and decreased the percentage of solids not sugar in the juice, thereby increasing the yield and the purity. The results of a comparison of superphosphate, nitrate of potash, and nitrate of soda gave no other indication than that phosphatic fertilizers improve the purity of the juice. The culture of sugar beets in Ontario is discussed and the condition of the beet-sugar industry described.

Culture of sweet potatoes in the Azores, BERNEGAU (*Tropenpflanzer, 6 (1902), No. 6, pp. 285–295, figs. 9*).—A detailed account of methods of sweet-potato culture in the Azores.

Irrigation of Sumatra tobacco, C. J. BLANCHARD (*Forestry and Irrig., 9 (1903), No. 6, pp. 292–295, figs. 2*).—A brief description is given of the methods of culture and irrigation practiced with Sumatra tobacco grown under shade in Florida. The method of irrigation considered most satisfactory is spraying by means of overhead pipes and nozzles.

HORTICULTURE.

Tomato culture, F. A. HUNTLEY (*Idaho Sta. Bul. 34, pp. 108–117, pl. 1, fig. 1*).—Directions are given for the culture of tomatoes in Idaho. Methods of treating the plants in the hotbed and cold frame, as well as transplanting to the field and field management, are discussed. One of the new features brought out in experiments at the station is the use of coal ashes in cold frames where tomato plants are grown. After the cold frame is made the bed is given a slight elevation with earth and then covered over with 2 in. of sifted coal ashes. The coal ashes are watered thoroughly, and on top of these is placed about 3 in. of deep, rich, mellow soil composed of

about $\frac{1}{3}$ well-rotted stable manure. The roots of plants grown in this soil do not permeate the coal ashes and hence are easier to transplant in the field than plants grown in deep soil where the roots grow long and are likely to be mutilated in taking out for transplanting.

Tomato plants were successfully grown from cuttings taken from the vines in the fall after a crop of tomatoes had been secured. Plants thus grown were always larger and stronger than plants grown from seed, ripened about 10 days earlier, and the total yield to the end of the season was about 5 per cent greater. In one experiment tomatoes were seeded in the hotbed on March 1 and again March 22. The older plants made a slower, better growth in the beginning and ripened their fruit from 3 to 10 days before the others. They also gave a slightly better yield. In a test of growing tomato plants on land that had never been manured and on the same soil heavily manured, plants on the unmanured portion of the field ripened their fruit earlier, but the yield of every one of 18 varieties tested was larger on the manured plat.

As a result of a test of 18 varieties the author recommends for the vicinity of the station the varieties Atlantic Prize, Spark Erliana, Trucker Favorite, Ignotum, Matchless, Noble, Ponderosa, and Stone. For northern Idaho and high latitudes where the season is shorter the varieties Atlantic Prize, Dwarf Champion, Spark Erliana, Fordhook First, and Ignotum are recommended. Atlantic Prize is specially recommended for the home garden.

A cooperative experiment with tomatoes was carried out with 2 farmers living in the higher regions of the State. The same varieties used were also grown at the station. The ripening period at Lewiston began nearly 2 weeks earlier than at Moscow and the relative rate of ripening was as 5 to 1 in favor of the higher locality. A successful method of culture in one of these experiments was worked out by plowing the rows east and west to more than a foot in depth. The plants were then set to within about 3 in. of the bottoms of the furrows and on the north side of the ridges. "These furnished shade from the hot sun at midday and protected the moisture at the roots, thus rendering each irrigation more effective and the necessity of application less frequent."

As in previous years, blight was found most prevalent on poor untilled soils. In one experiment on well-manured plats only 2 out of 80 plants blighted. In another test where the land was unmanured and the plants watered sparingly during the season, 30 per cent of the plants were lost by blight. On well-manured ground at the station only 1 plant out of 400 was lost by blight.

A manual of Egyptian farm crops and vegetables, G. BONAPARTE (*Ghizeh: School of Agriculture, 1903, pp. 81*).—Methods of growing various farm crops and vegetables common in Egypt are described and an account given of their uses.

The new ideals in the improvement of plants, L. H. BAILEY (*Country Life in America, 4 (1903), No. 3, pp. 181–185, figs. 21*).—The new idea in plant breeding is defined by the author as breeding for certain definite attributes "that will make the new generation of plants more efficient for certain purposes." Thus, in corn breeding the object is not simply to produce a new variety, but to get a variety that will contain more protein or oil or starch in the grain, or that will give a heavier yield per acre. The work of the Illinois Station in corn breeding is noted at some length, as well as that of Professor Hays in Minnesota with wheat and corn, and that of Professor Webber, of this Department, with cotton, grains, fruits, etc.

Systematic pomology, F. A. WAUGH (*Trans. Massachusetts Hort. Soc., 1903, I, pp. 51–69*).—A plea for the greater development of systematic pomology in this country, more particularly descriptive pomology. Forms of blanks used in describing fruits at the Massachusetts Agricultural College and the United States Department of Agriculture are given, together with the rules of the Horticultural Club of Cornell University for pomological nomenclature.

Fruits for the home garden: Varieties and culture, F. A. WAUGH (*Massachusetts Crop Rpt., May, 1903, pp. 29–39*).—The author enumerates and briefly describes the varieties of orchard and small fruits most desirable for the home garden in Massachusetts.

The experimental fruit garden, A. D. HALL (*Jour. Southeast. Agr. Col., Wye., 1903, No. 12, pp. 48, 49, pl. 1*).—The experimental fruit garden here noted was set out at Wye College in the winter of 1899–1900. One series of plats which was fertilized at the rate of 1,200 lbs. sulphate of potash, 400 lbs. sulphate of potash, and no potash per acre, respectively, show the best wood growth of trees on the plat heaviest fertilized with the sulphate of potash. Black currants which were planted among the trees also appeared much more vigorous and healthy and produced a larger growth on the plat which had received the largest amount of fertilizer. In another series of plats trees set out on deeply trenched ground were much more vigorous than trees set on ground simply dug over.

Report of South Haven Substation, T. A. FARRAND (*Michigan Sta. Bul. 205, pp. 23–49*).—An account in continuation of previous work (E. S. R., 14, p. 143) of the behavior at the station of a large number of varieties of raspberries, blackberries, currants, gooseberries, cherries, peaches, pears, plums, grapes, apples, crab apples, quinces, chestnuts, filberts, and walnuts, with descriptive notes in many instances of the more promising varieties. One of the features of the year has been the determination of the best methods of marketing different fruits. Red raspberries brought a good price throughout the whole season, but with black raspberries, and also with blackberries, the best prices were obtained for the very earliest and very latest varieties. Cherry varieties of currants sold for $1.25 for a 16-qt. crate, while all other varieties brought only 40 to 60 cents a crate. In the case of cherries no satisfactory commercial results were secured with sweet varieties, and the latest varieties of the sour cherries were most profitable.

In marketing peaches it was found that some of the better white varieties, well packed in open-slat, $\frac{1}{5}$-bu. baskets sold for a higher price in Chicago than many of the later yellow varieties. Plums were shipped on the same date to the same market in the following packages: One 16-qt. case, two $\frac{1}{5}$-bu. baskets, and one 4-basket crate, such as is used for tomatoes. The two $\frac{1}{5}$-bu. baskets equaled in size the one 4-basket crate. The 16-qt. case sold for $1. The 4-basket crate, containing 5 qts. less, also sold for $1, while the two $\frac{1}{5}$-bu. baskets sold for 35 cents each. There was thus a difference of 75 cents a bushel in favor of the 4-basket crate. The fruit in all the different baskets was as near alike as it was possible to grade it.

Four-pound baskets of Delaware grapes sold for the same price as 8-lb. baskets of large blue grapes. Oldenburg and Jonathan brought the highest price among apples. The demand for crab apples was found to begin the first week in September and to continue well into October. Hyslop brought the highest price throughout the season. In this connection it is stated that in harvesting crab apples the fruit must be picked while firm and crisp. If an attempt is made to hold it over it becomes mealy and sells for a lower price.

April 1 was found to be the latest practicable date at which trees could be sprayed with copper sulphate for the prevention of leaf curl. In a test of pruning peaches in the spring and in the fall better results were obtained from spring pruning. In some instances trees pruned in the fall killed back during the winter, and generally the wounds did not heal over as well as when pruned in the spring. A test in thinning peaches to distances apart of 8 in., 5 in., and not thinning at all was started during the season, to continue for 3 years. The good results of thinning on the appearance of the tree was noted during the first season, and the fruit from the thinned trees sold for nearly double as much as that from unthinned trees. Like results of thinning were also noted with plums. Plums thinned so that the fruit did not touch each other were larger, brought a better price in the market, and were less

affected by brown rot than plums on unthinned trees. The foliage was also of a better color and hung on the trees longer in the season.

An experiment was also carried out during the season with various kinds of cover crops in the orchard. Different plats were all seeded August 10. Cowpeas used as a cover crop were practically a failure. Oats proved especially valuable during the season, followed in order by barley, buckwheat, and sand vetch. Crimson and mammoth clover proved about equally valuable.

Report of the professor of horticulture, H. L. HUTT (*Ont. Agr. Col. and Expt. Farm Rpt. 1902, pp. 77–85*).—An outline of the horticultural work of the year with an account of the growth of orchard and small fruits at the college.

Experiments in orchard culture, W. M. MUNSON (*Maine Sta. Bul. 89, pp. 24, figs. 15*).—This bulletin contains accounts of fertilizer, culture and mulching experiments with apple orchards, a test of the value of potash in controlling apple scab, and directions for topworking orchards. In the first experiment one half of an orchard of 80 trees was kept thoroughly cultivated and the other half mulched with meadow hay or sawdust. Twelve trees on each half were left unfertilized, 14 were manured with stable manure, and 14 with commercial fertilizers. The work was begun in 1898 and the growth and condition of each tree in 1902 are commented upon. In general the trees on the cultivated area made the larger growth and produced the heavier yield of fruit. The growth in inches of the trees on the differently treated areas and the average yield per tree is shown in the following table:

Growth and yield of apple trees differently treated.

Variety.	Treatment.	Unfertilized.	Stable manure.	Commercial fertilizer.	Average yield per tree.
		Inches.	*Inches.*	*Inches.*	*Barrels.*
Gravenstein	Cultivated	7.50–9.66	7.00–8.00	8.5– 9.0	0.72
	Mulched	5.50–7.50	7.00–8.50	10.0 12.0	.59
Tallman	Cultivated	....	6.66–8.33	7.0– 8.5	.44
	Mulched	2.66–4.33	6.50–8.33	5.0– 6.5	.50

In the experiment to determine the effect of potash fertilizers on the development of apple scab, muriate of potash, sulphate of potash, and kainit, respectively, were used on the different plats at the rate of 1,000 lbs. per acre over an area of 15 ft. radius around each tree. The orchard was about 25 years old when the experiments began in 1898, and each year since then the trees have been regularly fertilized as noted. An examination of sample lots of apples of differently treated plats in 1902 shows 24 per cent of the fruit on the kainit plat free from scab, 28 per cent on the sulphate of potash plat, 47 per cent on the check plat, and 58 per cent on the muriate of potash plat free from scab. It appears from the figures given "that an excess of potash, in whatever form applied, has no effect whatever in warding off attacks of the apple scab."

Work in the renovation of an old orchard is announced as under way and the plan of the undertaking is outlined. Several different fertilizers were applied experimentally in 1902 and cultivation given. At the end of the season the good effects of both could be readily observed. The use of nitrogenous fertilizers alone greatly increased wood growth, but there was a noticeable lack of color in the fruit. Trees fertilized with acid rock alone did not appear better than those in the check plat. Potash alone, however, produced a distinct improvement.

One of the lessons learned in this work was that in order to control the bud moth and leaf roller the trees must be fed and cultivated as well as sprayed. Spraying to be effective must be done before the buds unfold for the bud moth and as soon as the leaves appear for the leaf roller.

Apple growing in Montana, R. W. FISHER (*Montana Sta. Bul. 44, pp. 59–71*).—Directions are given for the culture of apples in Montana and varieties suggested for planting at high altitudes. It is believed that sufficient apples for home use can be grown anywhere in the State below an altitude of 5,000 ft. Lists prepared from data obtained from growers are given showing the varieties of apples best suited to the different sections of the State.

The apple: Propagation, planting, pruning, and culture, W. F. MASSEY (*North Carolina Sta. Bul. 182, pp. 5–13, fig. 1*).—Popular directions are given for the planting and management of apple orchards in North Carolina.

Apples in North Carolina, T. K. BRUNER (*North Carolina Sta. Bul. 182, pp. 14–30, pl. 1, figs. 16*).—A list is given of the apples grown in North Carolina, with brief descriptions of the different varieties most suited for the family orchard and for commercial orchards. Varieties most suitable for culture in central and eastern North Carolina are also noted.

Preparing apples for market, T. K. BRUNER (*North Carolina Sta. Bul. 182, pp. 31, 32, figs. 3*).—Popular directions are given for barreling apples.

How to utilize the surplus apple crop, G. MCCARTHY (*North Carolina Sta. Bul. 182, pp. 34–38, figs. 3*).—A discussion of the preparation of dried and evaporated apples and the making of apple butter, marmalade, jelly, and fruit juices. It is believed much more advantageous to evaporate apples than to sun dry them, since evaporated apples sell for about 6 cents a pound, while sun-dried apples bring only $2\frac{1}{2}$ to $3\frac{1}{2}$ cents a pound. A profitable evaporator should have a capacity of not less than 300 lbs. of dried fruit per day. Such a machine costs about $100. The author deprecates the bleaching of fruits by fumes of burning sulphur and suggests instead that they be dropped into a tub of weak salt brine, made in the proportion of 1 lb. of clean table salt to 16 gal. of water, and boiled together for 10 minutes.

Cider vinegar, G. MCCARTHY (*North Carolina Sta. Bul. 182, pp. 39, 40*).—Brief directions are given for the home making of cider vinegar.

Peach growing in Missouri, W. L. HOWARD (*Missouri State Bd. Agr., Mo. Bul. 3 (1903), No. 3, pp. 20–34*).—Popular directions are given for the planting, growing, and marketing of peaches in Missouri.

Pruning peach trees, J. C. WHITTEN (*Missouri Sta. Bul. 55, pp. 211–240, figs. 15*).—An account of some experiments following the severe winter freezes of 1898–99 in pruning back peach trees. The cold had killed practically all the fruit buds, while the wood of the trees was badly discolored even to the heart. In the experimental work some of the trees were left unpruned for comparison. With others the new wood was pruned back about half, as is the customary yearly practice. In the majority of cases with the older trees the limbs were cut back into 3 or 4-year-old wood, leaving arms on the main branches 3 to 5 ft. long. Most of the pruning was done in February soon after the freeze, though in some instances it was continued until the leaves were just starting. The following spring the trees which were not pruned at all started into leaf growth first. They made a feeble growth during the summer, the growth being confined principally to the tips of the branches. There was almost no indication of growth in the body of the tree. Trees that had been pruned back severely were rather tardy in beginning growth in the spring. When growth finally started, however, it was very vigorous and continued throughout the season, some 6 to 9 ft. of new wood being made, which ripened up well during the season. Old trees that were cut back to the ground leaving only a stump died in many cases. Those that did sprout made an unsatisfactory growth. Trees pruned back by cutting away $\frac{1}{3}$ to $\frac{1}{2}$ of the 1-year-old wood also made unsatisfactory growth, but little better than where the trees were left unpruned entirely.

The best results were secured in pruning back into the 2 to 4-year-old wood, the severity of the cutting depending upon the age and vigor of the tree. It was observed that trees with smooth, bright-looking bark sent out branches from their trunks more

readily than those whose bark was thick, rough, and dull colored. There was practically no difference in the results obtained in cutting back the trees at different times from just after the freezing until the leaves had made some growth. In the rejuvenation of orchards thus severely pruned, good cultivation to properly aerate the soil in spring and to conserve moisture during the summer is advised.

Olive growing in Spain, J. G. LAY (*U. S. Consular Rpts., 72 (1903), No. 274, pp. 422, 423*).—A brief account of the pickling of green olives in Spain, with some statistics on the imports and exports of olive oil.

Olives and olive oil in France, R. P. SKINNER (*U. S. Consular Rpts., 72 (1903), No. 274, pp. 403–422, figs. 3*).—A rather detailed account of methods observed in France in preserving olives, treatment of olive-oil cake, clarification and filtration processes in olive-oil making, and the classification and uses of olive oil and cake. The idea that any considerable quantity of the olive oil imported into the United States from France is adulterated with cotton-seed oil is believed to be erroneous.

The mandarin orange group, H. H. HUME (*Florida Sta. Bul. 66, pp. 571–594, pls. 2*).—This study of the mandarin group of oranges contains a discussion of its present horticultural status in Florida and an account of its origin, history, and introduction into America, and scientific and common name. Descriptions are given of 9 varieties of these oranges, together with physical and chemical analyses of the 6 varieties commonly cultivated in Florida. The mandarin orange is essentially a fancy fruit. The variety Satsuma, which belongs to the group, is the hardiest known variety of oranges. According to the author the mandarin oranges had their origin in Cochin China. They were introduced into England about 1805 and into America at New Orleans between 1840 and 1850. The group is referred to the species *Citrus nobilis*. The fruiting period of the different varieties in Florida extends from October to the last of April. The most important sorts, noted in the order of fruiting, are Satsuma, China, Dancy, Oneco, and King. The author's estimation of the different varieties is as follows:

"Satsuma, China, and Dancy are well worthy of cultivation, but Satsuma is not recommended for planting in the extreme southern end of the State, and Dancy brings more money in most markets than China. Oneco is a variety of very fine quality, and if its bearing capacity equals its quality it will indeed prove a valuable acquisition. King has some excellent qualities and brings a good price in its season. . . . Cleopatra and Kino Kuni are worthy of cultivation only as ornamentals. Mikado is in no wise superior to Satsuma, which it closely resembles, and it is not so nearly seedless. Beauty, a variety of merit but untried, is recommended for trial. It is one of the best varieties grown in Queensland, Australia."

The physical and chemical analyses of 6 varieties are shown in the following table:

Physical and chemical analyses of mandarin oranges.

Varieties.	Average weight.	Seeds.	Pulp.	Rind.	Acid in juice.	Total sugar.	Total potash.	Total phosphoric acid.	Total nitrogen.
	Ounces.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Satsuma	4.35	0.0	76.2	23.8	1.019	7.80	0.2121	0.0386	0.1661
China	4.96	3.6	75.0	21.4	.838	7.49	.2576	.0758	.1404
Dancy	3.70	2.0	79.4	18.6	.884	9.51	.1903	.0591	.1500
Oneco	6.34	2.0	73.4	24.6	.807	9.48	.2732	.0573	.1653
Cleopatra	2.25	4.3	58.4	37.3	1.564	7.20	.3199	.0529	.1639
King	8.04	2.3	57.6	40.1	1.564	8.95	.2791	.0531	.1506

The largest percentages of phosphoric acid, potash, and nitrogen were found in the pulp of the fruit. The rind contained less than the pulp and the seed less than the rind. Estimates based on the above analyses are given for the amounts of fertilizer

elements removed by bearing trees and the amount of commercial manures necessary to use to replace them. Generally speaking, a fertilizer analyzing 8 per cent phosphoric acid, 12 per cent potash, and 3 per cent of nitrogen it is believed will meet the requirements of most citrus soils in Florida.

A new species of coffee from German East Africa, W. Busse (*Tropenpflanzer, 6 (1902), No. 3, pp. 142–144, fig. 1*).—A new species of coffee (*Coffea schumanniana*) found in German East Africa is described. It differs from *C. arabica* in that the latter has thicker leaves, more abundant bloom, larger fruit, and longer seed.

Bush fruits, F. W. Card (*Rhode Island Sta. Bul. 91, pp. 89–116, pls. 4*).—Besides some work with fertilizers for blackberries and raspberries and an account of the variation of yields with different plants and different varieties, which have been previously noted (E. S. R., 13, p. 740), data are given on the yields of varieties in hills and in hedges and on the culture of blueberries. When red raspberries and blackberries were grown in hedge rows nearly 3 times as heavy yields were obtained as when they were grown in hills. Crimson clover was tried as a cover crop for berries and gave very promising results. The strawberry weevil was found doing considerable damage to wild blackberries, but was not present to any extent in cultivated patches. Early Cluster and Taylor blackberries, Kansas, Eureka, and Nemaha black raspberries, and Cuthbert red raspberries have been found the most satisfactory varieties of these berries thus far grown. Experimental work with these fruits shows that in crossing it is necessary to remove the stamens of the flowers to prevent self-fertilization. Attempts have been made to propagate the swamp blueberries (*Vaccinium corymbosum*) by means of root cuttings, stem cuttings, and root grafts. These attempts have been only moderately successful, for while shoots were readily produced it was difficult to get the plants to root. Better results were secured when soil was used in which the blueberries had been previously grown. A fungus is nearly always found growing with the roots of the blueberries, and it is suggested that this fungus, together with an acid condition of soil, may be one of the essential conditions to the best development of blueberries.

Notes on small fruits, M. L. Dean (*Michigan Sta. Bul. 206, pp. 51–60*).—Notes are given on a number of varieties of strawberries, raspberries, blackberries, currants, and gooseberries grown at the station during the season of 1902, with descriptions of some of the most promising varieties.

The Lucretia dewberry, J. B. Gilchrist (*Delaware State Bd. Agr. Rpt. 1902, pp. 112–114*).—The author experimented with a number of systems of training the dewberry, as a result of which he has settled on the following method: No. 12 galvanized wire is stretched taut on cypress posts 3½ ft. long and driven 18 in. into the ground. The vines are trained on this wire. About 6 vines are left in each hill. Each branch is cut off about 4 ft. long and wound around the wire 2 or 3 times, 3 branches in each direction. The vines are fastened to the wire by a single piece of fine wire in the center. Thus treated, the approximate cost of growing an acre of Lucretia dewberries is placed at \$79.50. The average net receipts per acre for 4 years has been \$70.61 and the average yield 2,640 qts.

Strawberries for forcing, C. E. Hunn (*Amer. Florist, 20 (1903), No. 781, pp. 640, 641, fig. 1*).—The author considers Beder Wood the earliest variety of any value for forcing. The next in succession is Glen Mary which, all things considered, is the best variety ever used for forcing in the author's experiments. Other good varieties for forcing are Brandywine and Sharpless. Of 20 new varieties tested during the past winter but one, the President, proved of value for forcing.

Nitrate of soda in the culture of grapes, G. Chappaz (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 18, pp. 545–550*).—The effect of the different forms of nitrogen as represented in manure, nitrate of soda, and sulphate of ammonia, respectively, on the yield of grapes and quality of wine produced is being studied experimentally.

The data secured in 1901 have already been noted (E. S. R., 14, p. 358). In 1902 the heaviest yields were again secured on the nitrate of soda plat though the differences were not quite so striking as the year before. Classed according to the yield of grapes, the fertilizers rank in the decreasing order of importance as follows—nitrate of soda, barnyard manure, and sulphate of ammonia. Classed according to the quality of the products for wine, they rank as follows—sulphate of ammonia, nitrate of soda, and barnyard manure.

Phosphoric acid and the quality of wines, G. PATUREL (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 20, pp. 607–610*).—The author notes briefly the work done along this line and gives the results of analyses of a number of samples of red and white wines in which it is brought out that those wines which sell for the highest prices contain the largest percentage of phosphoric acid.

Composition and waste of fruits and nuts, W. R. LAZENBY (*Proc. Soc. Prom. Agr. Sci. 1903, pp. 101–108*).—The author made a study of the proportion of edible matter and waste of a number of varieties of grapes, apples, and nuts, and these data are here recorded in detail. Generally speaking, the better specimens of fruits contain the largest percentages of water. Thus in "nubbin" strawberries, "cull" peaches, and "runty" apples less than 80 per cent of water was found, while in the finest specimens of each of these fruits over 90 per cent was found. The total percentage of edible matter in such varieties of grapes as Jefferson, Brighton, Concord, Niagara, and Catawba was found to vary between 71.5 and 75 per cent. With wild grapes only about 40 per cent was edible, the seed and skins constituting 60 per cent of the fruit. The number of grapes in a pound, the number of seeds in each grape, and the weight of the seed for 7 varieties are shown in the following table:

Number and weight of seeds in grapes.

Variety.	Number of grapes in a pound.	Average number of seed for each grape.	Average weight of seed in one berry.
			Gram.
Niagara	168	2.7	0.035
Wilder	180	2.1	.042
Jefferson	200	2.6	.046
Catawba	200	1.7	.063
Brighton	216	2.2	.042
Delaware	480	1.3	.032
Wild Grape	1,984	1.2	.056

The composition of the juices of 4 popular sorts of grapes is shown in the following table:

Composition of grape juice.

Variety.	Juice in grapes.	Sugar.	Acid.	Proportion of acid to sugar.
	Per cent.	*Per cent.*	*Per cent.*	
Salem	55.5	7.1	0.59	1 to 12
Delaware	69.5	10.3	.59	1 to 17.4
Niagara	50.0	6.5	.48	1 to 13.5
Woodruff Red	70.0	8.8	.67	1 to 13.1

The edible portion of 25 varieties of apples as bought in the market was found to vary between 61 and 82.1 per cent, averaging 76.2 per cent; the average waste being 23.8 per cent. There was a tendency toward a higher percentage of waste in the smaller apples.

A large number of nuts were examined. The results obtained are summarized in the following table:

Analyses and value of nuts.

Kind of nut.	Number in 1 pound.	Shell or waste.	Kernel or edible part.	Quantity of kernel purchased for 5 cents.
		Per cent.	*Per cent.*	*Ounces.*
Large black walnut	20	82	18	7.2
Small black walnut	56	79.7	20.3	8.1
English walnut	54	58	42	1.7
Butternut	41	79.4	20.6	8.2
Large hickory	54	80	20	5.3
Shell-bark hickory	179	68	32	8.5
Spanish chestnut	37	12.5	87.5	4.6
American chestnut	230	25	75	3.9
Filbert	222	55	45	2.3
Large pecan	100	51	49	1.9
Small pecan	216	61.8	38.2	2
Brazil nut	48	62.3	37.7	1.9
Almond	83	72.5	27.5	1.1
Peanut	256	26.5	73.5	5.8

The author calls attention to the fact that the Brazil nuts examined were poor specimens, which reduced the percentage of kernel materially. There was also a loss of about 2 per cent of the weight of all varieties of kernels in cracking.

The culture and preparation of vanilla in German East Africa, R. BLITZNER (*Tropenpflanzer, 6 (1902), No. 4, pp. 164–174*).—This article deals with the planting and after culture of vanilla and with the fermentation, curing, and packing of the product.

Trees, shrubs, and vines of the northeastern United States, H. E. PARKHURST (*New York: Charles Scribner's Sons, 1903, pp. 451, pls. 50*).—This is a popular work describing more particularly the trees and shrubs found in Central Park, New York City. The second part of the book consists of descriptions of native and naturalized trees found in the northern United States from Maine to Virginia and west to the Mississippi, classified by their leaves. The work is designed more particularly for the nonbotanical reader.

Report of the committee on school gardens and children's herbariums for the year 1902, H. L. CLAPP (*Trans. Massachusetts Hort. Soc. 1902, II, pp. 232–263, figs. 15*).—This gives an account of the school garden work now being carried on in a number of different sections of the country, together with a chronological list of the articles published in this country on school gardens since 1890. In addition a list of persons actively engaged or interested in children's garden work is given and of the prizes and gratuities awarded for school gardens and children's herbariums during the year.

Chrysanthemums and fertilizers, A. BUYSSENS (*Rev. Hort. Belge, 26 (1902), pp. 265–270, figs. 3*).—This is an account of growing 10 different varieties of chrysanthemums with different fertilizers. All the plants were potted in a soil composed of 3 parts decomposed sod, 1 part vegetable mold, and 1 part sand. One lot of plants was used as a control and received no fertilizer. Another lot had fertilizers mixed with the soil. With a third lot a solution of fertilizers was made and the plants watered with this. In a fourth lot fertilizers were mixed with the soil in the pot and the plant was also watered with a solution containing fertilizers. With a fifth lot the fertilizers recommended by G. Truffaut and based on an analysis of chrysanthemum plants was used. In this case part of the fertilizer was placed in the pot and a part in the water used for watering the plants. In the sixth lot a trade fertilizer designated as "Papillon" was used. The best results in these experiments were

obtained with lot 4 in which fertilizers were mixed with the potting soil and also dissolved in the water used for watering the plants. Next in value stood lot 3 where no fertilizer was mixed with the soil but all used in a solution for watering the plants. The special fertilizer recommended by Truffaut gave the next best lot of chrysanthemums, while the control lot gave the poorest results.

Multiplication of the Dutch hyacinth, S. Mottet (*Rev. Hort., 75 (1903), No. 12, pp. 282–284, figs. 3*).—The various methods of treating hyacinth bulbs to obtain a large number of bulblets are illustrated and described.

Alpine flowers for gardens, W. Robinson (*London: John Murray, 1903, 3. ed., pp. 344, pl. 1, figs. 112*).—The author states that Alpine plants are easily grown in English gardens. Directions are given for the culture of Alpine plants, and the plants that can be best grown are arranged alphabetically and briefly described.

Manures for passion vines (*Agr. Gaz. New South Wales, 14 (1903), No. 3, pp. 252–255*).—The effect of a number of different fertilizers and combinations on the yield of passion vines is reported. The best results were obtained by the use of 4 different formulas, 3 of which are as follows: (1) 52 oz. dried blood, 9 oz. superphosphate, 6½ oz. potassium chlorid per vine; (2) 43 oz. nitrate of soda, 9 oz. superphosphate, 6½ oz. potassium chlorid per vine; (3) 32 oz. sulphate of ammonia, 18 oz. superphosphate, 8 oz. sulphate of potash per vine. The vines manured with complete fertilizers in this experiment gave heavy yields of fruit and appeared in a thrifty condition, while unmanured vines appeared to have become exhausted, although producing little if any fruit.

The largest mint farm in the world, W. E. Andrews (*World To-day, 5 (1903), No. 1, pp. 917–920, figs. 2*).—An account of the development of the mint industry in Michigan, by A. M. Todd, including the culture of mint and refining of peppermint oil.

Luther Burbank—an appreciation, E. J. Wickson (*San Francisco: Southern Pacific Company, pp. 48, pl. 1, figs. 40; reprinted from Sunset Mag.*).—The methods of work and the achievements of Luther Burbank in breeding plums, stoneless prunes, beach plums, quinces, apricots, almonds, blackberries, blueberries, daisies, lilies, amaryllis, clematis, gladiolus, cannas, columbine, roses, eschscholtzia, etc., are popularly reviewed, and an appreciative account given of the man.

FORESTRY.

The woodlot, H. S. Graves and R. T. Fisher (*U. S. Dept. Agr., Bureau of Forestry Bul. 42, pp. 89, pls. 4, figs. 30*).—This bulletin, which is called a handbook for owners of woodlands in southern New England, describes the forests of southern New England and suggests methods for the improvement of their condition. The handbook is prepared especially for the owners of woodland and its purpose is to show how second-growth wood, which comprises the principal forest area of New England, may be treated in order to yield larger returns than under the present methods. The methods of cutting which are recommended are simple and can be applied with beneficial results under conditions now existing in that region. The practice recommended by the authors for these second-growth forests consists of thinning the woods which are not mature so as to improve the conditions of growth and utilize material which is otherwise wasted, cutting in mature woods in such a way that the succeeding growth will follow quickly and be composed of valuable species, the pruning—which is only practicable in certain sorts of stands—protecting forest property against fire, and restocking waste land by planting and sowing. A number of diagrams are given which are sketched from actual conditions showing the application of the methods suggested for improvement cuttings.

Forestry and the lumber supply (*U. S. Dept. Agr., Bureau of Forestry Circ. 25, pp. 14*).—This circular consists of 3 addresses in which it is shown that forestry is

necessary for the perpetuation of the lumber industry of this country. The papers are entitled Forestry and Foresters, by President Theodore Roosevelt; The Exhaustion of the Lumber Supply, by R. L. McCormick; and The Lumberman and the Forester, by G. Pinchot.

Continual supply of forest products, E. Bruncken (*Tradesman, 49 (1903), No. 10, p. 52*).—The author attempts to show the importance of systematic forest conservation as a means for providing a continual supply of forest products, and adapts his remarks to the conditions found in the Southern States adjacent to and embraced within the proposed Appalachian Forest Reserve.

Railroad ties and forest supply (*Tradesman, 49 (1903), No. 10, pp. 77, 78*).—It is stated that 7,000,000 railroad ties are annually required for the renewal of those worn out on the various railroads throughout the country, and for the production of this number more than 300,000,000 linear feet of timber is required. An account is given of experiments which are being conducted by the Great Northern Railroad with a tie which is triangular in section instead of the ordinary 6 by 8 rectangular tie. This railroad tie presents a bearing surface of 12 in., and being triangular in section economizes very materially the amount of timber required. A number of these ties have been under observation in the terminal yard of the railway and it is claimed that the results show that this new form of tie is more effective under heavy service than that usually employed.

A new method of turpentine orcharding, C. H. Herty (*U. S. Dept. of Agr., Bureau of Forestry Bul. 40, pp. 43, pls. 15, figs. 5*).—This bulletin is an elaboration of Circular 24 of the Bureau of Forestry (E. S. R., 14, p. 874), in which a description is given of the proposed method of turpentine orcharding. In the bulletin this method is described in detail and the results of several years' tests are given. This new method consists in using galvanized iron troughs leading to earthen cups, instead of box cutting as in the former method. This new method has been given practical tests, in one of which the first, second, third, and fourth year crops were selected, and half of each crop was worked by the old box system, the other half by the cup system. The results obtained showed an increase of 23½ per cent in the output from the cupped half of the first-year crop, with a corresponding increase for the other crops. In addition to this increased production the trees are said to be left in a better condition, as they are not so deeply cut in preparation. The cost of this new method, while somewhat larger than the old one, can probably be reduced, and is more than fully offset by the increased production. There is also less waste, and a better quality of resin is obtained.

Seasoning of timber, H. von Schrenk and R. Hill (*U. S. Dept. Agr., Bureau of Forestry Bul. 41, pp. 48, pls. 18, figs. 16*).—This bulletin, which relates principally to the seasoning of railroad ties, telegraph poles, and railroad timber, gives a discussion of the distribution of water in timber, the relation of water to the decay of timber, the methods and objects of seasoning, and the advantages to be derived from the use of seasoned timbers. The principal investigations have been conducted with the seasoning of railroad ties. Different methods have been tested, and, so far as the authors' investigations have gone, the open piling is to be preferred at least with the lodge pole pine, which is principally used in Montana and elsewhere. It is believed that this method is to be preferred in the case of oak and other timbers. Whenever timbers have been given a treatment to preserve them from decay they should invariably be thoroughly seasoned after coming from the retorts in which they are treated. This seasoning by crystallizing the chemicals in the wood tends to materially prolong its efficiency against the entrance of destructive fungi. The general recommendations for seasoning timber are as follows: Green timber should be piled in as open piles as possible as soon as it is cut and so kept until it is air dry. No timber should be treated with chemicals until it is air dry, and timbers treated with a

preservative dissolved in water should be piled after treatment for several months to allow the water forced into the wood to evaporate. Under no circumstances should timber freshly treated with the water solution be exposed to weather conditions.

Forestry in the United States, W. SCHLICH (*Nature [London], 67 (1903), No. 1737, pp. 353, 354*).—A review is given of the forestry situation in the United States and an account presented of the organization of the forest schools, the policy of the Government as illustrated in the Forestry Bureau of this Department, and the forest reservation system of the Interior Department, and brief accounts of a number of the more recent publications relating to forestry in this country. The author highly recommends the beginnings that have been made, but points out that what has thus far been done will in no wise supply the threatening deficiency in forest products. On this account the author believes that more reservations should be established and greater care exercised in exploiting the forests yet remaining.

Eighth annual report of the chief fire warden of Minnesota, 1902, C. C. ANDREWS (*St. Paul: 1903, pp. 132, pls. 22*).—The author submits his annual report giving in some detail the results of the fire-protection system of Minnesota. During the year covered by this report forest fires were less destructive than formerly, due in part to the wet summer and autumn as well as to the more efficient patrol and suppression of incipient fires. The number of forest fires reported was 34, in which the damage is estimated at $3,820, and 46 prairie and field fires were reported in which the loss was estimated at $12,318. The location of these different fires, the area burned over, and the causes of fire as far as known are given. The reports of the various county officers, who are made fire wardens under the law, are briefly given and the modifications of the law passed by the last legislature are shown. The condition of forests in a number of parts of the State is briefly described, and the report concludes with a review of European forestry, different countries being discussed in some detail.

The forest policy of Pennsylvania, G. H. WIRT (*Jour. Franklin Inst., 155 (1903), No. 5, pp. 341–355*).—In this paper, which is a lecture delivered before the Franklin Institute, January 23, 1903, the author, who is State forester of Pennsylvania, outlines the forest policy of the State. This policy consists in aiding private forestry to become profitable and in promoting public forestry by acquiring the forest about the headwaters of principal streams. These forests are managed for the protection of the watersheds as well as for working out other forest problems.

Report on the forest administration in the Andamans, 1901–2, G. ROGERS (*Forest Dept., Andaman Islands, India, Rpt. 1901–2, pp. 46*).—A progress report is given of the forest operations under the direction of the writer, and general statements are given regarding the regulation and management of the state forests, the operations of the year, the preparation of working plans, and the exploitation of forests and collection of forest products.

Report on the forest administration of the Lower Provinces of Bengal, 1901–2, J. H. LACE (*Forest Dept., Bengal, India, Rpt. 1901–2, pp. 48 + IX*).—During the period covered by this report but slight changes have been made in the forest area. The area under the control of the forest department June 30, 1902, was 13,579 square miles of reserved, protected, and unclassified forest. A detailed account is given of the management of the state forests, the working plans discussed, and other administrative features presented. The improvement of forest growth by natural reproduction, artificial reproduction, thinnings, and various forms of cuttings are described at some length. A special report is given on the experiments being conducted with rubber-producing trees, and while the number of plants is somewhat limited the experiment with some species seems to be sufficiently promising to warrant its continuance. More than 42,000,000 cu. ft. of timber were removed by the various cuttings during the period covered by the report.

Report on the forest administration of the Central Provinces, 1901–2, B. ROBERTSON (*Forest Dept., Central Provinces, India, Rpt. 1901–2, pp. 50 + LXXXIX*).—A report is given of the chief forest commissioner, in which the annual reports of the conservators for the northern and southern circles of the Central Provinces are included. On account of a reclassification of the forest there was a decrease of 111 square miles in the total under the management of the forest department. Considerable progress is reported in the scientific working of the forest, and an increase of more than 400,000 cu. ft. of timber is reported as having been removed. The financial returns from both divisions are stated, showing not only increased gross receipts but a decided increase in the net proceeds. The system of forest-fire protection is reviewed at considerable length, and very satisfactory results have been secured by a very simple method of fire protection.

Report on the forest administration in the Punjab, 1901–2, F. B. BRYANT (*Forest Dept., Punjab, India, Rpt. 1901–2, pp. 22 + LV*).—A progress report is given of the operations that have been conducted in the forest administration of Punjab in 1901–2. Considerable development is shown in the resin and turpentine production. The cutting of timber and fuel was considerably in excess of any previous year, and the net profit for the year 1902 was 533,000 rupees, or about $200,000.

SEEDS—WEEDS.

Clover and its impurities, D. FINLAYSON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 2, pp. 8, pl. 1*).—Popular notes are given on the purity, germination, and specific gravity of white and alsike clovers. Both of these seeds frequently contain numerous weed seeds, the more common of which are figured and described.

Germination of maize, L. H. PAMMEL and G. M. LUMMIS (*Proc. Soc. Prom. Agr. Sci. 1903, pp. 92–96*).—According to the authors, a considerable portion of the corn in Iowa during 1902 did not mature properly and the question of the influence of immature ripening on germination was investigated. Samples of seed were tested from different localities and the results of the germinative tests are shown in tabular form. Wide variation is shown in the different lots, and accompanying the germination was noted a considerable development of different molds and other fungi. These are believed to have affected the germination of the corn to a considerable extent.

The effect of coal tar, coal oil, gasoline, etc., on the germination of maize, G. M. LUMMIS (*Proc. Soc. Prom. Agr. Sci. 1903, pp. 96–100*).—On account of the widespread belief that soaking corn in coal tar, coal oil, gasoline, benzine, etc., will repel troublesome enemies, the author investigated the effect of these substances upon the germination and subsequent growth of corn. The seed was soaked in the different solutions and planted in alternating rows with untreated seed. Seed that had been soaked in coal tar or coal oil was considerably injured, the germinative ability being reduced and the subsequent growth very greatly retarded. Plants grown from treated seed were yellow, weak, and decidedly inferior to those grown from the untreated seed. In duplicate tests conducted in the greenhouse about 90 per cent of the grain was killed by the treatment. Where more dilute solutions were tried it was found that while the percentage of germination was greater there was still some evidence of injurious effect. Gasoline, benzine, and the more volatile oils had little if any effect upon the germination of corn.

The grading and selection of seeds, C. D. GIROLA (*Elección y selección de las semillas. Buenos Ayres: P. Gadola, 1902, 2. ed., pp. 32, figs. 4*). An account is given of the agricultural condition of Argentina so far as the subject of seed selection and seed control is concerned, and the author gives suggestions for the grading and testing of seeds.

The germination of weed seeds, L. H. PAMMEL and G. M. LUMMIS (*Proc. Soc. Prom. Agr. Sci. 1903, pp. 89–92*).—For several years the authors have been carrying on investigations in weed studies, paying particular attention to the germination of weed seed. In the report given the results of experiments on the germination of weed seeds are noted, the germinative power of the seed immediately after maturity, after being stratified, and also of mature and immature seed being tested. It was found that most of the weed seeds would not germinate readily in the autumn after their production; some biennials and winter annuals, as shepherd's purse, dandelion, prickly lettuce, burdock, and others, being exceptions to the rule. A number of recently matured seed tested in a Geneva germinating apparatus failed to give any germinations, while the same seed stratified in sand and allowed to freeze germinated readily. The results of the germination of weed seed on a bench in a greenhouse, and also the results of stratification of the same seed are shown in tabular form.

Loco weed, L. E. SAYRE (*Trans. Kans. Acad. Sci., 18 (1903), pp. 141–144*).—A review is given of the popular beliefs regarding the loco weed (*Astragalus mollissimus*) and statements given regarding observations of the author and others upon its alleged poisonous properties. Attempts have been made to isolate alkaloids from this plant, but the results showed that the amount present was so small that the so-called locoism could not be produced by any alkaloid formed in the plant. The author thinks possibly some changes are undergone in the digestive tract of the animal that may result in the formation of some poisonous compounds, and this subject is to be one of further investigation.

Weeds, L. R. WALDRON (*North Dakota Sta. Spec. Bul. 2, pp. 4*).—This bulletin consists of a circular asking information regarding the distribution of weeds, their relative importance, means of dissemination, and methods of eradication. The information sought is preliminary to an extended study of the subject of weeds and their control.

DISEASES OF PLANTS.

Combating smut of cereals, S. TOPORKOV (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4 (1903), No. 1, pp. 58–64*).—Results of experiments in treating summer wheat and millet for the prevention of smut are given. These crops seem to be very subject to the destructive effect of smut, especially in the southwestern part of Russia. Preliminary experiments with soaking seed in ½ per cent solution of copper sulphate gave excellent results with summer wheat, less than 3 per cent of the crop produced from treated seed being affected as compared with 13.8 per cent of that from untreated. This treatment was continued for about 16 hours and proved somewhat detrimental to the germination of the seed. In subsequent investigations the author has found that soaking millet seed 5 minutes in a 1 per cent solution of copper sulphate was efficient in reducing the amount of smut and did not seriously depreciate the germination of the seed. In an experiment reported, the seed treated as above produced a crop about 4 per cent of which was more or less attacked by smut and the total yield of seed was about 1,876 lbs. per acre, while similar plats sown with untreated seed were attacked to the extent of 56.3 per cent and yielded only 960 lbs. of seed per acre. For the practical treatment of seed for the prevention of smut the author recommends dipping the seed inclosed in coarse sacks, which contain about 25 lbs. each, for 5 minutes in a 1 per cent copper sulphate solution, after which the seed is removed and may be dried.

Wheat smut experiments in 1901, W. FARRER (*Agr. Gaz. New South Wales, 14 (1903), No. 3, pp. 206–216*).—In continuation of previous experiments (E. S. R., 13, p. 659) the author has been investigating the subject of the prevention of stinking smut of wheat. The resistance of different varieties to this disease has been investigated, and wide variation was observed in the behavior of the varieties at different

times and in different soils. A number of fungicides were tested as preventive treatment when applied to the seed, and eau celeste was found to give such poor results as to be abandoned from further investigation. In the treatments which were carried out comparison was made of solutions of copper sulphate, corrosive sublimate, and formalin. In the trials made copper sulphate has proved quite satisfactory and being less poisonous is to be preferred to corrosive sublimate, although the latter is somewhat more efficient. The experiments, so far as they have been concluded, have shown the efficiency of formalin, and the author believes that subsequent investigations will show that this substance is to be preferred to either corrosive sublimate or copper sulphate for treating seed of wheat for the prevention of the stinking smut.

Experiments on the brown rust of brome grasses, E. M. FREEMAN (*Ann. Bot., 16 (1902), No. 63, pp. 487–494*).—The experiments here reported were undertaken to ascertain the relative capacity of infection of different species and the determination of some whose systematic position was somewhat doubtful. In all 40 species of Bromus were inoculated with spores from *B. sterilis* and *B. mollis*. The spores were placed upon the first foliage leaves of the plants and the plants given protection by bell jars against injurious influences. The weather throughout the period of the experiments was colder than normal, and the long period of incubation of many of the spores is attributed to this fact. Each experiment was continued for about 3 weeks, although a period of incubation of about 12 days was sufficient to demonstrate the ability of the fungus to infect the host. Of the species inoculated, 22 did not show any infection; 12 were successfully infected with the spores from *B. mollis* but not with *B. sterilis* spores. One species (*B. sterilis*) was only infected with the spores from that species, while 5 species of Bromus were equally infected with the spores of both species of rust.

Critical notes on Sclerospora of Gramineæ, G. B. TRAVERSO (*Malpighia, 16 (1902), No. 5–7, pp. 280–290, fig. 1*).—A study has been made of the various species of Sclerospora which are reported as occurring parasitically upon various grasses, and the author concludes that there are not more than 2 species of that fungus which attack the grasses. These species are *S. graminicola* and *S. macrospora*. The species which has been described as *S. kriegeriana* he says is undoubtedly the same as *S. macrospora*. The species described by Peglion as occurring on wheat is *S. macrospora* instead of *S. graminicola*, as that author has claimed.

The histology of Uredo dispersa and the mycoplasm hypothesis, H. MARSHALL WARD (*Proc. Roy. Soc. [London], 71 (1903), No. 473, pp. 353, 354*).—An abstract is given of a detailed study of the histological features of the germination, infection, and growth of the mycelium of the Uredo in the tissues of grasses, the work referring especially to the uredo form of *Puccinia dispersa* in the tissues of *Bromus secalinus*. The author critically examined the relation of the hyphæ and haustoria to the cell contents of the host, and the evidence obtained not only failed to support Ericksson's mycoplasm hypothesis (E. S. R., 10, p. 316) but so far as the histological facts observed are concerned they would indicate that Ericksson's observations are entirely reversed from the true order of events. The so-called special corpuscles observed by Ericksson are said by the author to be the cut-off haustoria of the fungus, and have no relation whatever with the subsequent development of the mycelium. The haustoria have been formed by the hyphæ, and not vice versa.

Diseases of flax and flax-sick soil, H. L. BOLLEY (*North Dakota Sta. Bul. 55, pp. 186–198, figs. 5*).—Since the previous publication regarding the flax wilt (E. S. R., 14, p. 55) a number of new points regarding the disease have come to light. In addition to the fungus (*Fusarium lini*) which was described as the cause of the characteristic wilt, a number of other fungi are now known to destroy the young plants and persist in the soil so as to seriously interfere with the growth of flax. Examinations of flaxseed and soil from a number of localities have shown the presence of the wilt organism, and in addition to the Fusarium there was found a species of Colletotrichum

and a species of Alternaria, both of which are very destructive to young plants in damp soils. The effect of these fungi upon the flax is described, and according to the author they may be carried not only in the soil but in the seed. On this account the selection of pure, clean, mature seed is highly important; and where the seed is suspected of being infected it is recommended that the flaxseed be treated with formaldehyde by spraying it with a fine spray and raking or shoveling over the grain until the surfaces are equally moist. If properly applied this can be done without the matting together of the seed. About ½ gal. of solution is required to wet a bushel of flaxseed. Investigations are also reported on the immunity of different races or varieties of flax to the disease, as well as the possible effect of the separation and use of different sized seed.

A study of Phoma betæ, J. HENRY (*Bul. Agr. [Brussels], 19 (1903), No. 1, pp. 156–163, fig 1*).—During 1901, in a season of a remarkably wet spring followed by a prolonged summer drought, the beets were severely attacked by the dry rot (*Phoma betæ*). The nature of the attack of the fungus and its effect upon the host are shown. As a result of the disease the sugar content as well as purity are very materially diminished. Beets which contained an average of 15.6 per cent sugar with a purity coefficient of 88 per cent were compared with badly diseased ones in which the sugar content was 10.9 per cent, and the purity coefficient of the juice 71 per cent. The results of analyses of the soils in which these different lots of beets were grown led the author to believe that the disease is largely influenced by the deficiency in certain fertilizers, principally in nitrogenous ones. For the prevention of the disease he recommends the thorough preparation of the soil and subsoil and the application of fertilizers which will supply any deficiency in mineral nutrients. He suggests that particular attention be paid to the presence of an abundance of organic material in the soil. So far as possible, varieties should be selected which are resistant to the disease and which are well adapted to the climatic and soil conditions where grown.

The protection of cane cuttings during transportation, A. HOWARD (*Reprint from Internat. Sugar Jour., 5 (1903), pp. 113–116*).—An account is given of experiments to test the shipping qualities of canes and means for protecting them against disease when shipped to a considerable distance. It was found that by treating the cane cuttings with Bordeaux mixture and afterwards packing them in pulverized charcoal they could be readily shipped to great distances without losing their vitality. If the cuttings and charcoal are kept too dry there will be a loss of vitality, but the proper amount of moisture has not yet been determined.

Combating black rot of cabbage by the removal of affected leaves, F. C. STEWART and H. A. HARDING (*New York State Sta. Bul. 232, pp. 43–64, pls. 2*).—An account is given of some recent field experiments on the treatment of the black rot of cabbage by the prompt removal of affected leaves. This method of treatment was investigated on account of the suggestion made by other investigators as to its being a possible means for the control of the disease. The effect of the black rot, mode of infection and dissemination of the organism are described. The method of treatment was the removal of all diseased leaves once a week from the first appearance of the disease until the end of the season. The theory upon which this treatment is based is that the bacteria gain entrance to the leaves along their margins or on wounds made by insects, and then pass downward along the fibrovascular bundles into the stem of the plant. The treatment aims at the saving of plants already slightly affected and the prevention of the spread of the disease by removal of the organism. Experiments along this line were carried on in 1899, 1900, and 1901, but the principal investigations were made in 1902. A field of cabbage was divided into equal parts and the diseased leaves removed from half the rows of 2 varieties, the other half-acre remaining as a check. The picking of the leaves began July 22 and was continued until September 16, the total time required being the services of one man for 46½ hours. Although the disease was so abundant that on the check plat

scarcely a plant was free from it, yet only a few plants were completely ruined. When the cabbage was harvested comparisons were made of the yield from each of the half-acres. As the result of the treatment it was found there was a loss at the rate of 5¼ tons per acre due to the removal of the leaves, in addition to the expense of the treatment, which is estimated at $11.62 per acre. The pulling of the leaves seems to check the formation of the heads and there is apparently evidence to show that the disease spreads not only through the leaves, but can gain entrance to the plants coming from the soil to the stems through the roots. Infection can also occur at the base of the leaves close to the stem, the organisms passing down the fibrovascular bundles into the stem, where it is beyond control.

Experiments with cauliflower for the prevention of the same disease have given results which warrant the continuation of the experiments of spraying the cauliflower with a resin-Bordeaux mixture. An experiment was conducted to determine how the removal of the lower leaves affects the yield of the cabbage plant. In this experiment alternate rows of cabbage had the 10 lower leaves removed with the result that the check rows gave a larger number of marketable heads of greater average weight than those which had had their lower leaves removed. The difference in this case was at the rate of 3 tons per acre.

An unsuccessful cabbage-rot remedy, F. H. Hall, F. C. Stewart, and H. A. Harding (*New York State Sta. Bul. 232, popular ed., pp. 9, fig. 1*).—A popular summary of the above bulletin.

A disease of the branches of fig, A. Prunet (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 6, pp. 395–397; Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 10, pp. 315, 316*).—According to the author, fig trees in the southwest of France are particularly subject to a disease which destroys the younger branches. This disease is attributed to attacks of Botrytis which is developed in the fruit remaining upon the trees during winter. Ordinarily the immature fruits in autumn remain on the trees and are attacked by this fungus. The fruits become mummified and bear upon their surfaces the fructification of the Botrytis. During mild weather the spores begin germination and spread through the peduncles of the fruits to the young twigs, causing their destruction. Another method of distribution is through the softening and falling from the branches of the decaying fruits. These frequently fall upon other branches and remaining there spread the infection from these centers. As a means for the prevention of this disease the author suggests the removal from the trees of all fruit at the end of the season.

The control of the sooty mold of the olive, D. Vidal (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 14, pp. 439, 440*).—The relationship between insects and fungi in producing the sooty mold of olives is shown, and the results given of a number of treatments in which Bordeaux mixture was used in connection with kerosene emulsion and Bordeaux mixture and turpentine. These treatments were found to be quite efficient, and in combating this disease a combined insecticide and fungicide should be used. The best results in his experiments were obtained with the Bordeaux mixture and turpentine solution. The spraying should be thorough, and can be done at a cost of about 5 cts. per tree per year.

The bitter-rot fungus, H. von Schrenk and P. Spaulding (*Science, n. ser., 17 (1903), No. 436, pp. 750, 751*).—As a result of the study of the synonymy of the bitter-rot fungus (*Glœosporium fructigenum*) the authors claim that the name should be *Glomerella rufomaculans*, n. sp., the previous names being preoccupied. The other well-known species of Glœosporium of this same group, according to the authors, would become *Glomerella cingulata*, *G. piperatum*, *G. cinctum*, and *G. rubicolum*.

Collar rot of the orange, C. Fuller (*Agr. Jour. and Min. Rec., 6 (1903), No. 5, pp. 150, 151*).—The occurrence of collar rot, root rot, gum disease, yellow leaf disease, etc., in Natal is noted, and the author points out the identity of the diseases which have been given these various names. The collar rot, as he prefers to call the trouble,

occurs in Natal under almost all conditions of soil, and in many cases it may be attributed to bad drainage, although in some instances a lack of drainage will not explain the occurrence of the disease.

The peach; its diseases and suggested remedies, W. A. BOUCHER (*New Zealand Dept. Agr. Rpt. 1902, pp. 456–460, pl. 1*).—The peach is said to be almost entirely free from insect pests in New Zealand, but is subject to considerable injury from a number of fungus diseases. Among the diseases described are peach curl, shot-hole fungus, peach rust, and attacks of *Clasterosporium amygdalearum.* This last fungus attacks both the bark and leaf, resulting in the defoliation of trees and their subsequent weakness. The author recommends early and persistent spraying with Bordeaux mixture composed of 10 lbs. of copper sulphate, 10 lbs. of lime, and 40 gal. of water.

Peach-leaf curl, G. E. STONE (*Massachusetts State Bd. Agr. Nature Leaflet 13, pp. 4, figs. 2*).—A description is given of the peach-leaf curl, due to *Exoascus deformans*, and spraying with Bordeaux mixture is recommended as an efficient means for its prevention. This fungus is said to annually cause a loss to the peach industry of the United States amounting to from two and a half to three million dollars.

Quince rust, G. E. STONE (*Massachusetts State Bd. Agr. Nature Leaflet 11, pp. 3, figs. 2*).—Brief illustrated notes are given on the quince rust caused by *Gymnosporangium* spp., for the prevention of which the author recommends thorough and repeated spraying with Bordeaux mixture.

The witches' broom disease of cacao (*Agr. News [Barbados], 2 (1903), No. 26, p. 117, fig. 1*).—An illustrated description is given of the witches' broom disease of cacao which was first noticed in Surinam in 1898. This disease greatly damages the trees and is accompanied by a hardening of the cacao pods to such an extent that their production is seriously diminished. In the absence of more definite knowledge of the fungus the only remedy to be suggested is the cutting out of the tufted branches and burning them as soon as observed.

The alternate form of Æcidium hibisciatum, W. A. KELLERMAN (*Jour. Mycol., 9 (1903), No. 66, pp. 109, 110*).—The occurrence of the æcidium of this rust in great abundance on plants of *Hibiscus moscheutos* led the author to search for its teleutosporic form. A number of plants were investigated which grew in the immediate vicinity and finally by means of cultures and inoculations the author discovered that the Puccinia form was *Puccinia muhlenbergiæ*, a common rust on *Muhlenbergia mexicana.*

A rust of the cultivated snapdragon, W. C. BLASDALE (*Jour. Mycol., 9 (1903), No. 66, pp. 81, 82*).—In 1895 the author reported the presence of the uredo stage of a rust on cultivated forms of snapdragon. Later the teleuto stages were produced and the fungus was determined to be a new one and named by Holway and Dietel *Puccinia antirrhini.* Since that time the fungus has appeared every season when attempts were made to grow this plant, completely destroying all plants before they reached the flowering stage. There appears to be no record of the occurrence of similar disease in other parts of the country, and the author suggests that on account of its destructive character it would be well to guard against introducing it into other regions.

Grape mildew and the use of sulphur, L. DEGRULLY (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 14, pp. 417, 418*).—Attention is called to the fact that for some years complaint has been made by certain viticulturists that the use of sulphur does not prevent the attacks of the powdery mildew of the grape. A number of these complaints were analyzed and the author concludes that the failure to prevent the development of the fungus was due in part at least to an insufficient use of sulphur. For the thorough protection of the grapevines at least 3 treatments should be given them in which either 130 kg. per hectare of triturated sulphur or 90 kg. of sublimated sulphur should be used. These figures are given as the maxima, which it is not always necessary to attain, but they should be fairly well approximated.

Brunissure of grapes; its cause and remedies, L. DEGRULLY (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 15, pp. 449–452*).—A discussion is given of some of the supposed causes of this disease, among them various fungi, insects, the lack of nutrition, the effect of overbearing, etc.; and a review is given in which it is shown that there seems to be some relationship between production and occurrence of the disease. Differences in susceptibility of varieties are also shown, those of the Vinifera, Labrusca, and Æstivalis types being quite subject to disease, while Riparia, Berlandieri, and Cordifolia are seldom or never attacked. The author seems to incline to the opinion that this disease is due to a lack of nutrition as well as overbearing. For its prevention he recommends thinning grapes to prevent overproduction, and better cultivation of the vines, furnishing them with an abundance of water and fertilizers.

The conidial form of the black-rot fungus, G. DELACROIX (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 26, pp. 1372–1374*).—In a previous publication (E. S. R., 13, p. 366) the author described a conidial form of the black-rot fungus (*Guignardia bidwellii*) which he stated was more or less common in the United States and occasionally met with under favorable conditions in France. Other investigators have since contested the accuracy of this description, and the author gives an account of investigations conducted during 1902 which have confirmed his previous conclusions.

The bluing and the red rot of the western yellow pine, H. VON SCHRENK (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 36, pp. 40, pls. 14*).—An account is given of the cause of the blue timber of dead wood of western yellow pine (*Pinus ponderosa*) and the effect of the coloring on the value of the wood, together with a description of the red rot of the same tree, the investigations being conducted with special reference to the Black Hills Forest Reserve. As a result of ravages of the pine bark beetle (*Dendroctonus ponderosæ*) a large amount of the bull pine has been destroyed. This wood seems to have undergone certain changes which result in its becoming of a decided bluish color. The effect of the insect attack is shown by the changed appearance in the color of the leaves following the attacks of the insects in July, August, and September. The leaves turn yellowish in color, the bright green fading almost imperceptibly, and later the yellow increases and is sometimes replaced by a reddish coloration. The third year the leaves drop from the trees, when they are known as "black tops." Soon after the attack of the bark beetles the wood of the pine begins to turn blue. This color at first is very faint but soon becomes deeper. The first signs of this change in color are observed several weeks after the attacks of the beetles at points on the trunk in the immediate vicinity of the attack. The color develops rapidly when once the tree is attacked, and standing trees examined in July, 1902, showed signs of blue coloration in 3 weeks after the appearance of the beetles. In general appearance the blue timber differs but little from the sound wood except in its color. The wood dries very rapidly and is said to become much tougher than green wood, and tests of the compression and breaking strength showed that blue timber 2 years old was stronger than the green timber.

The blue color of the wood is due to the growth of a fungus in the wood cells and it is believed that the fungus is the same as that described by Hartig as occurring in Europe. This fungus (*Ceratostomella pilifera*) occurs on coniferous woods, mostly on pine and develops rapidly in the medullary rays of the timber. The mycelium of the fungus can be readily observed in the split wood and the fruiting organs may be seen on the surface of the wood on which it is growing. A technical description is given of the fungus, its growth in various media, the dissemination of spores, and nature of the color. So far all attempts at extracting the color have failed but investigations show that changes of some kind have taken place in the wood fiber, the nature of which is not definitely understood. The changes brought about by this fungus can hardly be called a decay as the wood is sound to all ordinary appearances, and only after some time do the ordinary processes of decay set in.

The red rot described usually starts at the top of the "black topped" trees. This is caused by one of the higher fungi which grows in the wood and causes its decay. The conditions favoring the growth and development of the fungus, as well as its different stages of growth, are described, and a technical description given of the organism which, according to the author, is *Polyporus ponderosus*, n. sp.

The amount of diseased timber in this forest reserve is very great, and as the bark beetles are continuing their attack the amount is increasing. The investigations of the author show that if promptly used the timber is valuable and, so far as the blue timber is concerned, is not injured for the ordinary purposes to which this class of trees are put.

Some nematode diseases of tropical plants, G. DELACROIX (*Reprint from Agr. Prat. Pays Chauds, pp. 19, figs. 2*).—Descriptions are given of a number of nematode diseases which are caused by the widely distributed *Heterodera radicicola*. To this nematode the author attributes the banana disease of Egypt and a disease of black pepper in Cochin China (E. S. R., 14, p. 460), as well as a coffee disease in the West Indies. Associated with the nematode in the coffee disease is the mycelium of one or more fungi which cause the rotting of the roots of the plants.

Disease-resisting varieties of plants, L. LEWTON-BRAIN (*West Indian Bul., 4 (1903), No. 1, pp. 48–57*).—A critical review is given of some of the more important investigations that have been conducted in various parts of the world on the breeding and introduction of disease-resistant varieties of cultivated plants.

Notes on albinism among plants, E. PANTANELLI (*Malpighia, 16 (1902), No. 11–12, pp. 487–517*).—A critical study is reported of various forms of albinism, together with an inquiry into their causes and the various phenomena which attend this abnormal condition.

Fungus diseases and spraying, H. H. LAMSON (*New Hampshire Sta. Bul. 101, pp. 55–67, pl. 1*).—A brief general account is given descriptive of fungus diseases, and directions are given for the preparation and use of a number of the more common fungicides. Descriptions are given of a number of the more common diseases, special attention being given to those of the apple, grape, peach, plum, and potato. Where remedial or preventive treatments are known they are suggested.

Spraying for the control of insect pests and fungus diseases, T. W. KIRK (*New Zealand Dept. Agr. Rpt. 1902, pp. 434–449*).—The author gives in tabulated form the answers to a circular which was extensively distributed making inquiry regarding the results of spraying experiments for insect pests and fungus diseases. The tables show the fungicide or insecticide used and the effects produced, and the consensus of opinion was almost unanimous in favor of the value of spraying when considered from the commercial standpoint.

Combined fungicides and insecticides, L. DEGRULLY (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 19, pp. 565–568*).—On account of the possibility of combating fungus diseases and insects with a single treatment, the author has suggested spraying with a combined solution which consists of a copper fungicide and an arsenical insecticide.

ENTOMOLOGY.

The enemies of agriculture, A. L. HERRERA (*Las plagas de la agricultura. Mexico: Ministerio de Fomento, 1902, 1903, pts. 3–7, pp. 179–434, pls. 5*).—This is a continuation of the work of which the first and second parts have already been noted (E. S. R., 14, p. 467). The author discusses insects injurious to fruit trees; the economic importance of birds; the enemies of cacao, coffee, sugar cane, cereals, peas, asparagus, ornamental flowers; insect enemies of domestic fowls; ants, injurious locusts, etc.

Some injurious insects and fungus diseases of the year 1902, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 19–28, figs. 10*).—Notes are given on the sawfly (*Taxonus nigrosoma*), which commonly lives on species of jointweed, but which was found to be injurious to apples. Brief accounts are also presented of the injuries caused by woolly aphis, bronze birch borer, leaf spot of sugar beet and horse chestnut, shot-hole disease of plum and cherry, apple scab, pear scab, sooty fungus of apple, late blight of potatos, etc. T. D. Jarvis calls attention to the dangers from close proximity of mountain ash, wild plum, and chokecherry to fruit trees. These wild trees are infested with a number of insect and fungus pests which may readily spread to cultivated trees.

Entomological notes (*Jour. Bd. Agr.* [*London*], *9* (*1903*), *No. 4, pp. 519–525*).—Brief accounts of carrion beetles, *Hydræcia micacea*, *Cetonia aurata*, *Hedya ocellana*, *Laverna atra*, and *Phædon betulæ*. The last-named insect is reported as very injurious to mustard. It is recommended that all mustard plants be burned in the fall after being allowed to dry out. The destruction of these plants, together with other rubbish under which the beetles might hibernate, has been found to check the multiplication of the insects and to prevent a portion of the spring injuries.

Indian Museum notes (*Indian Mus. Notes, 5* (*1903*), *No. 3, pp. 61–216, pls. 14*).—As with the previous numbers of this publication, this number is occupied with original communications on injurious insects and with numerous miscellaneous notes on economic entomology. W. H. Ashmead (pp. 61, 62) describes as new the genus Eurycephalus, which belongs to the family Chalcididæ. E. E. Green (p. 63) describes a new species of scale insect under the name *Chionaspis decurvata*, which was found attacking rice. E. P. Stebbing (pp. 64–91) presents an account of insect pests of sugar cane in India. A large number of species are described and notes are given on the nature of the injury done by the different species and on means of combating them. J. Durrant (p. 92) describes a new genus of Tineid moth under the name Dasyses. E. E. Green (pp. 93–103) describes a number of new species of scale insects throughout India. These species belong to the genera Lecanium, Aspidiotus, Tachardia, Monophlebus, etc.

The remainder of this publication is occupied with notes on insect pests from the entomological section of the Indian Museum and includes brief accounts of insect enemies of forest trees, fruit trees, garden vegetables, cereals, corn, indigo, sugar cane, tea, opium, cotton, etc. A "lake fly" nuisance due to a species of Chironomus was investigated. It was found that this insect could be controlled by cleaning the borders of the lake, removing all weeds, and dredging away weeds and low mud banks which occur above the surface of the lake. The eggs of the fly are usually laid in such material.

The chinch bug in Maine, H. W. BRITCHER (*Maine Sta. Bul. 91, pp. 41–52, figs. 2*).—Descriptive biological and economic notes are given on this insect. The chinch bug is said to have been observed in Maine for the past 35 years. It is chiefly injurious to grasses and the remedies suggested are burning, spraying with kerosene or kerosene emulsion, and plowing under. A number of experiments were made for the purpose of testing the power of the chinch bug to withstand unusual conditions. As a result of these experiments it was found that the hibernation of the chinch bug does not represent a period of continuous torpidity, but a period which may be interrupted at any time during the winter by seasons of warm weather. Complete submersion in water, even for a considerable period, did not always prove fatal. Freezing in water was almost always fatal to chinch bugs, while freezing in a dry or moist atmosphere proved to be a less effective check.

The root borer of sugar cane, N. B. WATSON (*West Indian Bul., 4* (*1903*), *No. 1, pp. 37–47, figs. 3*).—Notes are given on the habits and life history of *Diaprepes abbreviatus*. The insect is described in its various stages. The unusual increase of this species is believed to be due to the destruction of birds and reptiles by the

mongoose. In order to control the insect it is recommended that sugar cane should not be planted on fields which have previously borne sweet potatoes, peanuts, or guinea corn, all of which serve as host plants for the borer. The use of lime on the land is believed to have a beneficial effect.

The yellow-winged locust (Camnula pellucida), C. B. SIMPSON (*U. S. Dept. Agr., Division of Entomology Circ. 53, pp. 5, fig. 1*).—This locust is said to have occurred in large numbers in Idaho and Utah during the last few years. Notes are given on its habits and life history. For controlling the insect the author recommends plowing the fields, spraying with oil, the use of hopperdozers, and arsenical baits.

The codling moth, E. D. SANDERSON (*Delaware Sta. Bul. 59, pp. 22, pl. 1, fig. 4*).—The codling moth is described in its various stages and notes are given on its life history. In Delaware there appears to be only a partial second brood and the insect winters almost without exception as a caterpillar. Brief notes are presented on its natural enemies and on the results of insecticide experiments. As a result of banding apple trees, from 4 to 15 per cent of the larvæ were caught. The use of trap lanterns was found to be of little value. Insecticide experiments were largely confined to spraying with arsenite of lime, Paris green, and Disparene, at the rate of 1 pt. per barrel, 1 lb. per 150 gal., and 3 lbs. per 150 gal., respectively. Arsenite of lime sprayed twice gave 20 per cent of benefit; Paris green sprayed twice, 61 per cent; Disparene with 1 application, 60 per cent, and with 2 applications, 87 per cent. Similar results were obtained in other series of experiments. The addition of 20 per cent of kerosene or crude oil appeared to have no bad effect upon the trees, but seemed to increase the number of wormy fruits. The addition of permanganate of potash, resin soap, molasses or glucose had no beneficial effect in increasing adhesion. Three applications of the insecticides appeared to be no better than 2. It was also found that the use of more than 1 lb. of Paris green to 200 gal. of water was no more effective than smaller quantities. Green arsenoid appeared to be equally effective with Paris green.

The codling moth, J. M. ALDRICH (*Idaho Sta. Bul. 36, pp. 137–155*).—Descriptive and biological notes are given on this insect. There are said to be 4 apple growing regions in Idaho. In southwestern Idaho, the most important apple shipping section of the State, great damage is done by codling moth, from 50 to 100 per cent of untreated apples being effected. Southeastern Idaho suffers but little injury from codling moth. In northern Idaho it is not a serious pest. Around Lewiston it once caused great damage, but at present apple trees are being replaced with other fruits which are not attacked by this insect. Observations made on the biology of the codling moth at Lewiston showed that the first worms entered the apples on June 19, the calyces of the apples having been open as late as May 10. The first moths appeared July 14 and moths from the larvæ of the second brood appeared on September 3 and 4. On unsprayed trees 52 per cent and on once-sprayed trees 44 per cent of apples were found to be infested when examined in October. This loss was believed to be almost wholly due to the third brood. In another instance the third brood appeared between September 15 and 21. As a rule, however, there are 2 broods in Idaho. Four series of spraying experiments were made to determine the comparative effectiveness of Paris green and arsenate of lead, to compare one application of spray at the time the blossoms fall with one made just before the worms enter the apple, and to compare 1 spraying with 2 or more. The results of these experiments show that Paris green is more effective than arsenate of lead and also more resistant to rain. Spraying just after the blossoms fall was more beneficial than applying as the worms were about to enter the apples. Two sprayings were recommended, where the larvæ appear in large numbers.

The control of the codling moth, C. B. SIMPSON (*U. S. Dept. Agr., Farmers' Bul. 171, pp. 24, figs. 4*).—Descriptive and economic notes are given on the codling moth.

An account is presented of the distribution of the insect, its natural enemies, and the artificial remedies to be adopted in controlling it. These remedies include spraying with arsenical insecticides, such as Paris green, London purple, and white arsenic compounds, and banding the trees. When these remedies are applied intelligently from 85 to 98 per cent of the fruit is saved, while without the application of any remedial measures from 85 to 100 per cent of the fruit becomes infested.

Two common scale insects of the orchard, W. E. Britton (*Connecticut State Sta. Bul. 143, pp. 10, pls. 2, figs. 5*).—Biological and economic notes are given on scurfy bark-louse and oyster-shell bark-louse. There is but 1 generation of these scales in Connecticut. The scurfy bark-louse is chiefly injurious in nursery and rows of newly set orchards, while the oyster-shell bark-louse is said to be found on nearly every old apple tree in Connecticut. Applications should be made during the first half of June or just after the eggs hatch. For this purpose common soap at the rate of 1 lb. in 8 gal. of water, or kerosene emulsion may be used.

Report of the inspector of San José scale, 1902, G. E. Fisher (*Toronto: Ontario Dept. Agr., 1903, pp. 24*).—The author discusses the general status of the San José scale problem in Ontario and gives notes on the entomological discussions held at the Pittsburg meeting of the Association of Economic Entomologists. Brief notes are also given on nursery inspection, municipal inspection, and the distribution of whale-oil soap, crude petroleum, lime-sulphur-salt, and other insecticides to the owners of infested orchards. The experiments conducted by the author during the season included tests of whale-oil soap, fish-oil emulsion, crude petroleum, crude oil and soap, lime-sulphur-salt wash, fumigation, and other methods for the destruction of the San José scale. Whale-oil soap was found to be an effective but costly remedy. An emulsion of fish oil, with or without potash, proved quite satisfactory. Diluted crude oil also proved to be an excellent remedy, but undiluted crude oil should be applied with care. Lime-sulphur-salt wash gave excellent results and was found to be quite safe for any kind of fruit trees. Formulas are given for the preparation of these various insecticides.

The scale insects of the lesser Antilles, II, H. Maxwell-Lefroy (*Imp. Dept. Agr. West Indies, Pamphlet 22, 1903, pp. 50, figs. 47*).—In this pamphlet the author continues his discussion of the scale insects of the Lesser Antilles, 31 species being dealt with. This makes a total of 51 species which are at present of economic importance or likely to prove so in the West Indies. Notes are given for the purpose of rendering identification of these species comparatively simple for fruit growers, and approved remedies are briefly discussed.

Scale insects of the West Indies, H. Maxwell-Lefroy (*West Indian Bul., 3 (1903), No. 4, pp. 295–319*).—Notes are given on the native and introduced species of scale insects in the West Indies and lists are presented of these species, together with others which are likely to be introduced into foreign countries from the West Indies. Special attention is given to the habits, food plants, predaceous and parasitic enemies, fungus diseases, and means of controlling these insects.

Scale insects and mites on citrus trees, C. L. Marlatt (*U. S. Dept. Agr., Farmers' Bul. 172, pp. 43, figs. 34*).—This bulletin contains in a condensed form material already published on the same subject in the Yearbook of this Department for 1900 (E. S. R., 13, p. 266).

Two insects injurious to the strawberry, J. M. Stedman (*Missouri Sta. Bul. 54, pp. 187–210, figs 5*).—The strawberry false worm (*Harpiphorus maculatus*) develops only 1 brood per year in Missouri. The larvae hatch out about the time the first strawberry blossoms appear and remain on the plants until the berries are ripe. Descriptive and biological notes are given on this species. The insect may be controlled by thorough dusting with pyrethrum. This substance may be sprayed upon the plants at any time, even when the fruit is ripe. It may be necessary to make 2 or 3 applications to control the pest. The larvae may also be destroyed by spraying

with powdered hellebore or Paris green, using the former in the proportion of 1 lb. to 3 gal. of water, and the latter at the rate of 1 lb., together with 3 lbs. fresh lime, in 150 gal. of water. These remedies, however, must not be applied after the berries begin to ripen. White hellebore is considered the best and safest remedy.

The common strawberry-leaf roller (*Phoxopteris comptana*) produces 3 broods annually and the insect is found in one or more stages throughout the summer. No practical remedy was found for the first brood, but the second and third broods may be destroyed by mowing the strawberry plants immediately after harvesting and burning them as soon as dry.

The organization of a campaign against the enemies of grapes, I. Pachoski (*Zap. Imp. Obshch. Selsk. Khoz. Yuzh. Ross., 72 (1902), No. 11–12, pp. 34–41*).—On account of the serious injuries to grapes from the attacks of insects in the region of Odessa, the author recommends that the government be requested to establish 2 experiment stations for the protection of cultivated plants. It is also recommended that the regular agricultural societies be urged to distribute instruments and insecticides such as would be required for carrying out the instructions of experts.

A disease of grapevines caused by Dactylopius vitis and Bornetina corium, L. Mangin and P. Viala (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 6, pp. 397–399*).—It was found that *Dactylopius vitis* causes considerable injury to grapevine roots in Palestine where this disease was investigated. The scale insects puncture the roots and cause an escape of sap, which is used by the fungus for its own growth. The fungus mycelium finally covers the scale insects so that they are protected against insecticides and other unfavorable conditions. The authors consider this to be a case of symbiosis. Experiments with remedies indicate that the scale insects are easily killed by injecting bisulphid of carbon into the soil before the fungus mycelium becomes too thick.

The white fly of greenhouses, C. M. Weed and A. F. Conradi (*New Hampshire Sta. Bul. 100, pp. 45–52, fig. 1*).—Various greenhouse crops in New Hampshire are said to be commonly attacked by the white fly. According to the observations of the authors the eggs hatch within 13 days. No evidence was obtained to show that the insect can pass the winter out of doors. Brief notes are given on the injuries produced by this insect upon plants. Experiments were made with Kerowater sprays, and with hydrocyanic-acid gas. The adult white flies were readily killed by spraying with a mechanical mixture of kerosene and water containing 5 per cent kerosene. The most successful and most satisfactory remedy, however, was fumigation with hydrocyanic-acid gas. A portion of a greenhouse containing 2,833 cu. ft. of space was treated by mixing 12 oz. of strong sulphuric acid, 12 oz. of potassium cyanid, and 1 gal. of water. The house was kept closed for 15 minutes. This and similar experiments were repeated, with the result that all adult flies appeared to be killed and none of the plants were injured. Directions are given for estimating the cu. ft. of space in greenhouses and for producing the gas.

Pests of coffee and means of combating them, J. Rossignon (*Cafetal, 1 (1903), No. 1, pp. 9, 10*).—The author discusses briefly the habits and life history of *Dactylopius destructor*, *Melolontha vulgaris*, *Lecanium coffeæ*, and *Hemileia vastatrix*. Formulas are presented for insecticides and fungicides which have been found effective in destroying these pests.

Animal pests of the rose, and means of controlling them, F. R. von Binnenthal (*Die Rosenschädlinge aus dem Tierreiche, deren wirksame Abwehr und Bekämpfung. Stuttgart: Eugen Ulmer, 1903, pp. X+392, figs. 50*).—This volume constitutes a handbook of information regarding insect pests of rosebushes, and various natural and artificial remedies for the control of these pests. The author presents an account of the typical forms of injuries to plants by insects, and also of the biology and life history of insects. One chapter is devoted to a discussion of remedies for the control of insects. These include the ultilization of natural enemies of insects and the

artificial application of various insecticides, such as tobacco decoction, Nessler's fluid, quassia, pyrethrum, hellebore, turpentine oil, kerosene, crude petroleum, carbolic acid, cresol, napthaline, Paris green, caustic lime, corrosive sublimate, carbon bisulphid, kainit, copper sulphate, copperas, proprietary remedies, and fumigation with various gases, including hydrocyanic-acid gas. The numerous insects which are known to be injurious to roses are classified according to their systematic position, and discussed under the orders to which they belong, including Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera, Orthoptera, and Hemiptera. The author also discusses the injurious effects of red spiders and nematode worms. The volume is provided with an index which renders the information contained in it very accessible.

Antheræa cytherea on Pinus insignis at Fort Cunynghame plantation, J. SIMS (*Agr. Jour. Cape Good Hope, 22 (1903), No. 4, pp. 446–454, pls. 3*).—The caterpillars of this insect are reported as having defoliated *Pinus insignis* to a large extent and to cause some doubts as to the feasibility of successfully growing this tree in plantations. The depredations caused by the insects are becoming less pronounced from year to year, and the author believes that the tree can be cultivated despite the attacks of the caterpillars. Notes are given on the habits and life history of this insect. It is parasitised in the egg and caterpillar stages, and is also affected by a bacterial disease. No birds or mammals were observed feeding upon it.

The net-winged midges (Blepharoceridæ) of North America, V. L. KELLOGG (*Contrib. Biol., Hopkins Seaside Lab., Leland Stanford Jr. Univ., 1903, No. 30, pp. 183–232; pls. 5, fig. 1*).—Notes on the anatomy, habits, and life history of species of this family, a number of species being described as new.

Intraradical nutrition of diseased trees for the purpose of curing them and destroying parasites, I. SHEVUIREV (*Selsk. Khoz. i Lyesov., 209 (1903), Apr., pp. 58–103, figs. 5*).—The author describes a number of experiments in which various substances were introduced directly into the trunks and roots of trees, especially birch and apple trees, for the purpose of testing the absorptive power of these trees and the effect of the substance upon injurious insects. A list of substances thus used included potassium silicate, copper sulphate, various solutions of eosin, fuchsin, carmin, etc. These substances were introduced into the tree in openings produced by means of an auger. As a result of these experiments the author believes that a means has been found of benefiting the tree by nutrient solutions at the same time that insects are prevented from committing depredations upon the treated trees. A brief bibliography of this subject is presented.

The [Alabama] horticultural law. Notes on some of the insects and fungus diseases affecting horticultural crops, R. S. MACKINTOSH (*Alabama Sta. Bul. 124, pp. 73–104, figs. 8*).—A copy is given of the recent act passed by the Alabama legislature providing means for the protection of horticulture, fruit growing, and truck gardening. The horticulturist of the station is made State horticulturist in charge of the enforcement of this act. The pests specified in the act as dangerous are San José scale, new peach scale, black knot, crown gall, peach yellows, peach and plum rosette, and woolly aphis. Notes are given on the appearance, habits, and means of combating these pests and formulas are suggested for the preparation of suitable fungicides and insecticides.

Report of the inspector of fumigation appliances, 1902, P. W. HODGETTS (*Toronto: Ontario Dept. Agr., 1903, pp. 15, figs. 2*).—The condition of districts infested with San José scale is said to be quite serious. Brief notes are given on spring and fall inspection for this insect and on the results of experiments to determine the influence of hydrocyanic-acid gas on plants. Extensive tests with this insecticide showed that plants of all species bear treatment without harm.

Crude oil and soap, a new general insecticide, H. MAXWELL-LEFROY (*West Indian Bul., 3 (1903), No. 4, pp. 319–326*).—Attention is called to the desirability of using crude oil in the place of kerosene wherever possible on account of the much

greater cost of the latter. A number of kinds of crude oil have been used in the West Indies in combination with soaps. One formula which has been found to be quite effective is as follows: 10 lbs. whale-oil soap, $5\frac{1}{2}$ pts. crude Barbados oil, 4 oz. naphthalene. Kerosene emulsions were tested at the rate of 1 lb. to 10 gal. water and were found effective against plant lice, mealy bugs, and the majority of scale insects.

Spraying calendar for 1903, C. F. CURTISS, H. C. PRICE, and H. E. SUMMERS (*Iowa Sta. Spraying Calendar, 1903, pp. 8, fig. 1*).—This spraying calendar contains a list of economic plants, with notes on pests which attack them and approved remedies for controlling these pests. Formulas are also given for the preparation of the more important fungicides and insecticides.

Spraying calendar, L. R. TAFT and C. D. SMITH (*Michigan Sta. Spec. Bul. 19, folio*).—Formulas are given for the preparation of the more common insecticides and fungicides and a short list of economic plants is presented, showing the more important pests to which these plants are subjected, the remedies which should be applied, and the time of application.

Mosquitoes and other insects of the year 1902, R. H. PETTIT (*Michigan Sta. Spec. Bul. 17, pp. 26, figs. 26*).—Representatives of the genera Culex, Anopheles, Psorophora, Conchyliastes, and Urotænia are found in Michigan. An experiment was made on the college grounds in treating ponds with kerosene oil. The oil was applied at the rate of 1 oz. for 15 sq. ft. of water by the use of a knapsack pump. Applications were made at various intervals from April 26 to July 15. The season was unusually wet and strong winds helped to blow other mosquitoes into the grounds, so that the results of the experiment were left somewhat doubtful. Notes are given on the numbers of larvæ and pupæ in a given area. The effect of the oil persisted for about 3 weeks. A fungus belonging to the genus Entomophthora was observed living parasitic upon mosquitoes. The same fungus was found also on a fly and a species of Diplax.

Notes are given on the habits and injuries caused by *Lecanium longulum.* This scale was found to be parasitised by a fungus which is described as a new species, under the name *Isaria lecanifera.* Notes are given on the growth of this fungus on agar, potato, and corn meal.

Brief notes are also presented on *Pseudococcus acericola,* periodical cicada, Angoumois grain moth, hickory-bark beetle, and *Basilarchia arthemis.* The last-named insect is reported as injurious to young apple trees. Periodical cicada was found to be parasitised by the fungus *Massospora cicadina.*

Mosquitoes and other insects of the year 1902, R. H. PETTIT (*Michigan Sta. Bul. 204, pp. 13–20, figs. 4*).—A popular edition of Special Bulletin 17 noted above.

Mosquito extermination in practice, E. M. BENTLEY ET AL (*Lawrence, L. I.: Board of Health [1903], pp. 42, dgm. 1*).—The Board of Health of Lawrence, L. I., has undertaken the problem of destroying the mosquitoes in the vicinity of the town. The destruction of fresh-water mosquitoes was found to be very simple, while much more trouble was experienced in fighting the salt-water mosquito (*Culex sollicitans*). The use of oil or drainage of pools was found to be quite efficient in destroying the fresh-water mosquitoes. The observations made in Lawrence indicate that *C. sollicitans* may deposit eggs not in water but on mud at the roots of grasses. Another important fact was determined, viz, that this mosquito does not breed in places where the daily tides enter freely. Two plans were followed in fighting these mosquitoes—the use of petroleum on breeding pools, and ditches. The petroleum method was found to be too expensive, although quite effective. During the season about 6 miles of shore line was treated by the ditching method. During the progress of this work about 20 miles of ditches were made at a cost of about $1,700. The results were very encouraging. Brief notes are given on breeding of mosquitoes in

barrels, cans, and small pools in out-of-the-way places. C. B. Bennett presents biological and economic notes on *C. sollicitans*, *C. pipiens*, and Anopheles.

The fly and mosquito as carriers of disease, H. D. GEDDINGS (*Ohio Sanitary Bul., 7 (1903), No. 2-3, pp. 31-39*).—A popular discussion of the agency of flies and mosquitoes in carrying malaria, yellow fever, typhoid fever, and filariasis, together with notes on the means of eradicating the fly and mosquito nuisance.

Report of lecturer on apiculture, H. R. ROWSOME (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 147, 148*).—As a result of a number of experiments in stimulative feeding of bees it was found that the temperature of the hive could not be reduced without injury. Feeding with sirup containing a large proportion of water proved to be injurious, especially to old bees. Feeding with honey or properly prepared sirup indicated an advantage for this system of stimulative feeding. Notes are also given on the protection of bees in winter in chaff hives, storing honey in paper sacks and using unfinished sections.

Apiculture (*Jour. Jamaica Agr. Soc., 7 (1903), No. 4, pp. 145-148*).—Statistics are presented concerning the importation of honey into Great Britain, and the production of honey in California, Italy, and France. Brief notes are also given on the quality of honey produced in Jamaica.

Modern bee keeping, W. F. REID (*Jour. Soc. Arts, 51 (1903), No. 2631, pp. 522-529, figs. 9*).—The author presents an historical account of the development of knowledge concerning the habits and life history of bees and of the production of various devices for the more convenient management of bees and for increasing the production of honey.

Bee matters, A. GALE (*Agr. Gaz. New South Wales, 14 (1903), No. 3, pp. 247-251, figs. 2*).—The author briefly discusses the care of young swarms and the regulation of the time of swarming, together with an account of wire section-cradles and the use of these devices in ordinary hives.

An outline of the conditions and means of increasing the production of honey, A. KIRILLOV (*Selsk. Khoz. i Lyesov., 208 (1903), Feb., pp. 389-422; Mar., pp. 603-637, figs. 6*).—This article contains a general account of the various practices which have been found beneficial in increasing the yield of honey. The author devotes particular attention to a discussion of the location of the apiary, the construction of hives, efficiency of various breeds of bees, artificial feeding of bees, and care of swarms.

Bees as related to fruit growing, T. W. DITTO (*Agr. Student, 9 (1903), No. 8, pp. 165, 166*).—A popular account of the agency of bees in the fertilization of fruits.

The causes of the sexual differentiation in colonies of bees, F. DICKEL (*Arch. Physiol. [Pflüger], 95 (1903), No. 1-2, pp. 66-106, fig. 1*).—This article is of a controversial nature and in it the author seeks to show that the queen bee does not have the power of predetermining the sex of the bees which hatch from different eggs. It is maintained as a result of an extensive series of experiments carried on by the author that the queen bee lays but one kind of egg, and that all eggs are fertilized. The production of workers, queen bees, and drones from these eggs is brought about by different care and food which is provided by the worker bees. According to the author's experiments the worker bee appears to be the only possible source of the peculiar nutritive or stimulating food which is required to produce a queen bee from an egg which, if treated in the ordinary manner, would have given rise to a worker bee.

A new beehive with trapezoidal frames, J. FARCY (*Jour. Agr. Prat., n. ser., 5 (1903), No. 9, pp. 287-290, figs. 3*).—The author describes the details of structure of a hive used by P. Chiris, and containing trapezoidal frames. The external wall may be double, and the chief advantages of this form of frame are the case with which swarms may be protected against cold and the great convenience in removing frames for inspection.

Foul brood of bees; the symptoms, treatment, and means of preventing the infection of hives, A. Butkevich (*Selsk. Khoz. i Lyesov., 208 (1903), Jan., pp. 36–60*).—A detailed description is given of the symptoms of this disease and of the usual methods by which it is conveyed from one hive to another. For controlling the disease the author makes a number of recommendations based on his own observations and those of others. It is stated that foul brood is not as infectious or as difficult to eradicate as has usually been assumed. On the contrary, it appears to yield readily to treatment. In treating swarms for the presence of this disease the author recommends that the queen be removed and that the bees be kept in a swarming basket for about 3 days, after which they may be placed in the hive on clean comb and fed for a short time on sirup containing a small quantity of salicylic acid. In order to prevent the development of foul brood it is recommended that all colonies be fed in the spring on sirup containing salicylic acid and that all sour honey be removed.

Bacillus mesentericus and B. alvei, F. C. Harrison (*Rev. Internat. Apicult., 25 (1903), No. 2, pp. 29–32*).—This is a controversial article in which the author presents a number of arguments against the identity of these 2 organisms as claimed by Lambotte. The author believes that if these organisms were identical, foul brood of bees should occur spontaneously in countries where bees have never been imported from infected localities.

Raising silkworms in Algeria (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 6, pp. 121–128*).—Experiments have shown that both the mulberry and the silkworm thrive well in Algeria. The first definite experiments in this direction were begun in 1842. Notes are given on the life history of the silkworm, the feeding, and various other processes connected with the development of the worms, and the diseases to which silkworms are subject in Algeria.

FOODS—NUTRITION.

Studies on the digestibility and nutritive value of bread, H. Snyder (*U. S. Dept. Agr., Office of Experiment Stations Bul. 126, pp. 52, pls. 3*).—A number of experiments are reported on the digestibility and nutritive value of bread made from whole wheat, patent, and graham flours ground from hard spring wheat and soft winter wheat. In every case the different grades of flour were ground from the same lot of grain.

Briefly stated, the most important deductions from the results of these investigations with hard and soft wheat are in accord with the conclusions drawn from the earlier investigations of this series (E. S. R., 14, p. 770). The nutritive value of flour, in so far as the quantities of digestible protein, fats, and carbohydrates, and available energy are concerned, is not increased by milling the wheat in such a way as to retain a large proportion of bran and germ. The differences in the amounts of total nutrients furnished the body by the various grades of flour are, however, relatively small, all grades being quite thoroughly digested. The coarser flours have a tendency to increase peristaltic action, and are on this account especially valuable for some persons. Judged by composition and digestibility, all the flours are very nutritious foods, which experience has shown are wholesome as well. When also the fact is taken into account that they furnish nutritive material in an economical form, their importance is evident. The fact must not be lost sight of that using different grades of flour for bread making and other household purposes offers a convenient method of adding to the variety of the daily diet, a matter which is of undoubted importance.

The digestibility by man of peas cooked in soft and hard water, A. P. F. Richter (*Arch. Hyg., 46 (1903), No. 3, pp. 264–273*).—The author was himself the subject of experiments, each of 2 days' duration, in which about 600 gm. of cooked peas were eaten per day. In the first test the peas were cooked to a purée in dis-

tilled water and in the second in hard water, and in both cases the cooked material was passed through a sieve. The food and feces were analyzed. The peas cooked in distilled water were better borne and caused less digestive disturbances than the others. When cooked in distilled water the peas had the following coefficients of digestibility: Dry matter 92.86, protein 89.84, fat 87.56, and ash 81.09. When the peas were cooked in hard water the coefficients were as follows: Dry matter 91.08, protein 83.40, fat 58.92, and ash 51.78. Data are also given regarding the amount of calcium and magnesium oxid consumed and excreted in the urine and feces in the 2 experiments. The observed inferior assimilation of peas cooked in hard water the author attributes in part to the formation of alkaline earth albuminates and alkaline earth soaps which are not broken down by cooking or by the digestive juices, and in part by digestive disturbances caused by the alkaline earth salts, especially magnesium chlorid present in the hard water used.

Hens' eggs, E. CARPIAUX (*Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 2, pp. 200–212*).—The importance of eggs as food is pointed out and a number of analyses, including determinations of phosphoric acid and lime, are reported of the eggs (whole egg, white, and yolk) of several different breeds of hens. In every case the eggs were cooked for an hour in a steam bath. It is stated that the loss in weight during cooking was insignificant, ranging from 0.03 to 0.1 gm. per egg. As was to be expected the weight of the eggs varied within rather wide limits, the Braekel eggs weighing on an average 66.45 gm. each, being the heaviest, and the eggs of bantams (Barbu d'Anvers), weighing 29.55 gm., being the smallest. The author notes that the proportion of yolk is greatest with the eggs of bantams and, generally speaking, with the eggs of the breeds best suited for fattening. Both the yolk and the white of the eggs of the different breeds varied somewhat in composition and the author discusses the differences at some length. Attention is especially called to the lecithin content of the yolk and its importance in nutrition.

Physiological economy in nutrition, R. H. CHITTENDEN (*Pop. Sci. Mo.*, *63* (*1903*), *No. 2, pp. 123–131*).—The author briefly reports an experiment with man in which the average amount of protein consumed per day was 44.9 gm. and the energy value of the diet 1,606 calories, the subject being practically in nitrogen equilibrium, the amount excreted in the urine and feces being on an average 6.90 gm. per day as compared with an income of 7.19 gm. The diet was very simple and the subject was careful to masticate it very thoroughly. The food is said to have been very thoroughly digested. On the basis of this experiment the possibility of the ordinary dietary standards being too large is discussed. However, it should be noted that the values chosen for comparison represent total nutrients and not digestible nutrients, the former being considerably in excess of the latter.

Metabolism of matter and energy at high altitudes, F. HUEPPE (*Arch. Physiol.* [*Pflüger*], *95* (*1903*), *No. 9–10, pp. 447–483*).—A summary and discussion of experiments on metabolism at high altitudes, with special reference to the needs of the body and the relative value of different nutritive materials.

The calculation of the heat of combustion from the elementary composition, E. VOIT (*Ztschr. Biol.*, *44* (*1903*), *No. 3, pp. 345–361*).—The author gives a formula which he has found to be useful for calculating the heat of combustion of chemical compounds by means of elementary composition, and discusses it at considerable length.

The fuel value of the oxygen in some substances of physiological importance, O. KRUMMACHER (*Ztschr. Biol.*, *44* (*1903*), *No. 3, pp. 362–375*).—Experiments which are reported lead the author to conclude that the heat of combustion of materials of complex composition can be calculated by the method proposed by E. Voit. (See above.)

Examination and valuation of preserved fruits and fruit marmalades, VON RAUMER (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *6* (*1903*), *No. 11, pp. 481–492*).—

Chemical studies are reported and discussed which had to do with the fermentation and the adulteration of preserves and marmalades, the presence of added coloring matter, preservatives, etc.

Sustaining power of Demerara sugar (*Internat. Sugar Jour., 5 (1903), No. 52, p. 157*).—A brief note quoting Sir Martin Conway to the effect that he found a quarter of a pound of sugar per man per day of advantage as a food in mountain climbing.

Concerning respiratory metabolism during static work, A. Bornstein and E. Poher (*Arch. Physiol. [Pflüger], 95 (1903), No. 3-4, pp. 146-157*).—The effects of static work as distinguished from dynamic work were studied with special reference to changes in the respiratory quotient. The work consisted in holding a weight in the right hand, the arm being raised perpendicularly and the subject being in a reclining position. The authors conclude that metabolism is increased by static work, the amount being greater rather than directly proportional to the weight sustained, and also greater rather than directly proportional to the duration of the work.

The article is followed by a brief note by N. Zuntz.

The lecithans, their function in the life of the cell, W. Koch (*Univ. Chicago Decen. Pubs., 10 (1902), p. 1; abs. in Jour. Phys. Chem., 7 (1903), No. 3, pp. 230, 231*).—"Lecithan" is proposed as a name for the group including such compounds as egg lecithin, kephalin, myelin, paramyelin, etc. Data regarding the estimation of such bodies is given and their importance is discussed.

Contribution to the study of diuresis. VII, Diuresis when excretion is hindered, W. Filehne and W. Ruschhaupt (*Arch. Physiol. [Pflüger], 95 (1903), No. 9-10, pp. 409-438*).—Experimental data reported and discussed.

Contribution to the subject of diuresis. VIII, Further experiments on water absorption, W. Filehne and Biberfeld (*Arch. Physiol. [Pflüger], 95 (1903), No. 9-10, pp. 439-446*).—Continuing work noted above, experimental data are reported and discussed.

The tramp's handbook, H. Roberts (*London and New York: John Lane, 1903, pp. 175, pls. 9, figs. 34*).—In this volume the author pays especial attention to methods of camp cookery and gives information regarding the use as food of many sorts of game, fish, and vegetable products found in Great Britain, a number of which are not commonly eaten.

Progress in the examination of foods and condiments, including fats and oils, during the year 1902, Utz (*Oesterr. Chem. Ztg., 6 (1903), Nos. 6, pp. 121-124; 7, pp. 148-150; 10, pp. 221-224*).—A general summary.

Regulations of the superior board of health of Porto Rico (*San Juan: Board of Health, 1903, pp. 34*).—The text of the regulations governing the importation, sale, etc., of foods and drugs is given.

ANIMAL PRODUCTION.

Decomposition of feeding stuffs and foods by micro-organisms. IV, Cleavage of vegetable materials by bacteria, J. König, A. Spieckermann, and A. Olig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), Nos. 5, pp. 193-217; 6, pp. 241-258; 7, pp. 289-296*).—An extended review of the literature of the subject is given and experiments are reported on the decomposition of cotton-seed meal by micro-organisms. The principal conclusions follow: The different sorts of micro-organisms decomposing cotton-seed meal have similar physiological characteristics and are affected by the composition of the meal and also by the air supply. When air is entirely excluded rod-like micro-organisms of the *Bacterium coli* type, which form sugar with the evolution of gas, develop freely, as well as the coccus types, which produce sugar without gas evolution. Indifferent varieties are also observed which do

not cause fermentation and require only a small amount of material for their nourishment. Obligate anaerobies do not ordinarily grow in cotton-seed meal. The acids produced by the bacteria which form sugar hinder the development of such forms.

When the amount of air is limited, only the sugar-fermenting varieties are observed in the inner portion of the decomposing meal. On the surface, bacilli with very resistant spores, which attack protein violently, soon gain the upper hand. These penetrate into the mass as the acid formed by the coli types is neutralized by the ammonia which they form. The bacterial growth is always accompanied by a measurable loss of organic material. When air is excluded this loss is largely carbohydrates. When the air supply is limited the loss at the beginning is almost entirely this nutrient. Later on protein and pentosans are actively attacked. Fat is generally only a little changed. Crude fiber is at first markedly increased and later diminished. The sugar fermenting bacteria decompose pentosans, fat, and probably proteids also, though in a less degree. They cause a marked fermentation of raffinose, producing gases and acids.

Bacteria which attack the proteids of cotton-seed meal cause the same kind of cleavage in vegetable and animal proteids, including fibrin. The following cleavage products were identified: Albuminose, peptones, amin bases, volatile fatty acids such as butyric and valeric acids, aromatic acids as phenylacetic and phenylpropionic acids, succinic acid, skatolcarbonic acid, aromatic oxygen acids, indol, skatol, phenol or kresol, ammonia, carbon dioxid, and volatile sulphur compounds. At no stage of the decomposition of cotton-seed meal were poisonous bodies formed by the bacteria commonly present, a fact which was brought out by physiological experiments.

Meat meal, V. SCHENKE (*Landw. Vers. Stat.*, *58* (*1903*), *No. 1–2*, *pp. 9–35*).—The available information regarding the composition and feeding value of meat meal has been summarized and discussed, experiments on the feeding value of this material for different farm animals being referred to in considerable detail.

Meat meal made from diseased animals, V. SCHENKE (*Landw. Vers. Stat.*, *58* (*1903*), *No. 1–2*, *pp. 36–54*).—The author has summarized the available information regarding the composition, feeding value, and wholesomeness of meal made from contaminated meat, diseased animals, etc. ("*Kadavermehl*"), the product being, of course, sterilized during the process of manufacture. A bibliography is included.

Fish meal, V. SCHENKE (*Landw. Vers. Stat.*, *58* (*1903*), *No. 1–2*, *pp. 55–64*).—On the basis of available information the composition and feeding value of fish meal is discussed at length. The article contains a bibliography.

The feeding value of fish meal, S. HALS and A. KAVLI (*Norsk. Landmandsblad*, *22* (*1903*), *No. 3*, *pp. 38–41*).—Analyses of fish meal made from slightly salted herring and from the offal of heavily salted herring are given. The percentage composition of the former was as follows: Water 11.11, protein 61.11, fat 14.06, and ash 11.79; of the latter, water 10.81, protein 49.29, fat 13.17, and ash 23.06. As shown by artificial digestion experiments the meal from whole herring furnished 12.7 lbs. of digestible fat and 56.3 lbs. of digestible protein per 100 lbs. Similar values for the offal meal were 11.9 and 42.6 lbs. The 2 kinds of fish meal, taking into account the fertilizer value, are to each other according to the author as 100 to 75.—F. W. WOLL.

New food for live stock in Germany, B. F. LIEFELD (*U. S. Consular Rpts.*, *71* (*1903*), *No. 268*, *pp. 79, 80*).—The manufacture and use of a blood molasses feed is described.

The use of molasses in feeding farm animals, B. DE LAUJARDIÈRE (*Bul. Agr. Algérie et Tunisie*, *9* (*1903*), *No. 7*, *pp. 153–155*).—The value of molasses is pointed out in this article, which is quoted from *Annales du Mérite Agricole*.

Cane-sugar molasses, A. and P. ANDOUARD (*Bul. Sta. Agron. Loire-Inférieure*, *1901–2*, *pp. 39–42*).—Proximate and ash analyses of cane and beet molasses are reported. Cane molasses is regarded as superior for animal feeding on account of its

low ash content, which was found to be 2.23 per cent as compared with 11.45 per cent in the beet molasses.

Cocoanut-oil meal (*Agr. News [Barbados], 1 (1902), No. 17, p. 259*).—Statistics are given concerning the production of cocoanuts and data are quoted regarding the composition and value of the nut and cake.

Local [peanut] oil cake (*Agr. Jour. and Min. Rec. Natal, 6 (1903), No. 5, pp. 151, 152*).—A brief note on the use of a peanut cake made from nuts grown in Natal.

Composition of green feed stuffs, J. C. Brünnich and W. Maxwell (*Queensland Agr. Jour., 12 (1903), No. 5, p. 356*).—Analyses are reported of samples of fresh *Panicum maximum*, *P. muticum*, and fresh and drought-dried *Paspalum dilatatum*.

Additional notes on West Indian fodders, F. Watts (*West Indian Bul., 3 (1903), No. 4, pp. 353–362*).—This paper includes analytical data and a discussion of the feeding value of guinea grass (*Panicum maximum*), para grass (*Panicum muticum*), bed grass (*Sporobolus indicus*), hay grass (*Andropogon caricosus*), guinea corn (*Sorghum vulgare*), *Stylosanthes procumbens*, and sugar-cane tops.

Analyses of some of the commercial feeding stuffs of Michigan, F. W. Robison (*Michigan Sta. Bul. 203, pp. 11*).—Feeding stuffs gathered from different parts of the State were analyzed. These include cotton-seed meal, oil-cake meal, oil meal (old process), gluten meals and feeds, malt sprouts, oat middlings, bran, mixed commercial feeds, breakfast food by-products, starch refuse, starch feed, and dried sugar-beet pulp. The approximate cost of protein in the different feeding stuffs is discussed.

Feeding stuffs, E. J. Russell and F. T. Holbrook (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 129–143*).—Analyses of a number of feeding stuffs are reported, including among others compound cakes and meals, cocoanut meal, urhur (an Indian pea meal), peanut cake, malt coombs (the rootlets of germinating barley), brewers' grains (fresh and dried), bean meal, and rice meal. The feeding value of a number of materials is discussed as well as the subject of balanced rations.

Glycogen, E. Pflüger (*Arch. Physiol. [Pflüger], 96 (1903), No. 1–8, pp. 1–398*).—An exhaustive summary of the subject, dealing with the origin, occurrence, and estimation of glycogen and related topics.

Concerning the nucleo-proteid of liver, I, J. Wohlgemuth (*Ztschr. Physiol. Chem., 37 (1903), No. 5–6, pp. 475–483*).—Experiments which are reported led to the conclusion that the carbohydrate of the liver nucleo-proteid is l-zylose.

Concerning resorption in the intestine, IV, R. Höber (*Arch. Physiol. [Pflüger], 94 (1903), No. 5–6, pp. 337–346*).—A continuation of earlier work (E. S. R., 13, p. 775) on the rapidity of resorption in the intestines, especially of salts of heavy metals which unite with proteids or proteid derivatives.

Chemical composition of the carcass of farm animals, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 20, pp. 626, 627*).—Data are quoted regarding the elementary composition of beef, mutton, and pork, mineral constituents present, etc.

Experiments with fattening steers, G. E. Day (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 69–71*).—Several recent tests carried on at the station are reported. In the first the comparative value of roots and silage was studied in continuation of previous work (E. S. R., 13, p. 1075). Five animals fed roots (turnips and mangels) and hay 2:1 in addition to grain made an average daily gain of 1.78 lbs. throughout the feeding period, which covered 119 days, 4.53 lbs. grain, 6.57 lbs. hay, and 13.94 lbs. roots being required per pound of gain. During the same time 8 steers fed corn silage and hay 2:1 in addition to grain made an average daily gain of 1.76 lbs. per steer, 4.32 lbs. grain, 6.48 lbs. hay, and 13.21 lbs. silage being required per pound of gain. The cost of a pound of gain in the 2 rations was 8.09 and 7.80 cents, rating roots and silage at the same price per ton.

"In this experiment, therefore, a ton of silage showed a higher feeding value than a ton of roots; and in this respect the result is similar to that of last year, though the difference in favor of silage was greater last year."

To determine whether it is more satisfactory in fattening steers to buy moderately heavy animals and feed them for a short period or lighter, thinner animals and continue feeding them for a longer period, 7 large steers were fed for 119 days and 6 smaller steers for 174 days, the larger animals being given 0.94 and the smaller animals 0.59 lb. of grain per day per 100 lbs. live weight. The heavy steers gained 1.83 lbs. per head per day, consuming 16.15 lbs. dry matter per pound of gain. Similar values for the other steers were 1.6 lbs. and 13.52 lbs.

The author notes that although the results were markedly in favor of the longer feeding period it would be unsafe to draw conclusions from a single test and proposes to make further trials.

In connection with the feeding experiments reported the relative gains made by 3-year-old and 2-year-old steers on the same ration were noted. The 3 older animals made an average daily gain of 1.87 lbs. per head for 119 days and the 4 younger animals of 1.82 lbs., the dry matter required per pound of gain in the 2 cases being 16.95 lbs. and 15.74 lbs. "While the 3-year-old steers made slightly the larger gains, they required more food for a pound of gain than the 2-year-old steers."

Phosphates for cattle, E. RYLEY (*Agr. Jour. and Min. Rec., 6 (1903), No. 4, pp. 130, 131*).—Directions are given for preparing a mixture of phosphates and other salts for use as a cattle lick.

Sheep breeding at the Agricultural College, J. MAHON (*Queensland Agr. Jour., 12 (1903), No. 5, pp. 313, 314*).—Brief notes regarding the breeding and management of sheep at the Queensland Agricultural College.

Fattening lambs, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, p. 71*).—Using 2 lots of 10 lambs each the comparative merits of roots and silage supplementing a ration of hay with 1.5 lbs. mixed grain per head was studied in a test covering 15 weeks. The roots and silage were fed with the hay in the proportion of 2:1. The average gain per lamb per week on the root ration was 2.12 lbs. and on the silage ration 1.81 lbs., the dry matter required per pound of gain in the 2 cases being 11.1 and 12.94 lbs., respectively.

Pig feeding experiments with cotton-seed meal, R. R. DINWIDDIE (*Arkansas Sta. Bul. 76, pp. 133–148*).—With a view to securing information regarding the harmful effects observed when cotton seed is fed to pigs, a number of tests were undertaken in which this material constituted a larger or smaller part of the ration. In the first series, which included 12 pigs, averaging from 30 to 50 lbs. in weight, 9 of the animals died in from 34 to 64 days when given a daily allowance per head of 0.6 to 0.8 lb. cotton-seed meal mixed with ground bran or corn. Three pigs fed bran and corn chops 1:3 only remained in good health, gaining 0.9 lb. per day for 56 days. It was noted that when mixed with wheat bran or wheat chops the cotton-seed meal was less dangerous than when mixed with ground corn. It is suggested that possibly this is because the corn mixture is not bulky enough. It is pointed out that the ration containing wheat bran or wheat chops, though the more satisfactory, is badly balanced and therefore wasteful.

In a later test with more bulky feed 14 pigs were given a mixture of cotton-seed meal, wheat bran, wheat chops, and cut cowpea hay for a period of 6 months without evident harmful effects, the quantity of cotton-seed meal eaten per day averaging from 0.8 to 1.4 per cent of the body weight, or from 0.4 to 0.7 lb. for a pig weighing 50 lbs. In one test cotton-seed meal in the same proportion was fed to a sow during the last 80 days of pregnancy without harm to mother or progeny.

It has been suggested that the harmful effects following cotton-seed feeding are due to the oil contained in the seed; therefore 3 pigs were fed for 20 weeks a ration of corn meal and wheat bran 1:2 (with some green feed during a part of the time) with from 1 to 4 oz. of crude cotton-seed oil added, an amount which is greater than that contained in a quantity of seed which proved fatal. No evil effects were noted

"and it is probable that the harmful effects of overfeeding with cotton-seed meal are not attributable to the oil which it contains."

In all cases post-mortem examinations were made of the pigs which died after consuming a ration containing cotton-seed meal. "The characteristic post-mortem feature of cotton-seed-meal poisoning in all our cases was an acute dropsy of the pleural and heart sacs with intense congestion (probably secondary) of the liver and kidneys, [the] immediate cause of death being suffocation from compression of the lungs." . . .

"The economy of feeding cotton-seed meal to pigs is a question which our experiments were not especially designed to solve, except in so far as this is influenced by the mortality of the feeding animals. Unless the percentage of deaths can be reduced to insignificant proportions, it is obvious that cotton-seed meal never can be an economical food. After a method of feeding has been evolved which secures this end, the comparative value of the food from an economic standpoint may be determined by appropriate tests.

"As we have seen, the maximum amount in which cotton-seed meal can be fed to hogs is about one-half pound per day to [young] pigs, and for larger animals probably about 1 lb. It can therefore only form a small proportion—one-sixth or so—of any purely grain ration fed, but even in this proportion may prove to be of economic value since it contains the most expensive elements of the ration. . . .

"As to the length of time which [a small quantity of] cotton-seed meal can be fed, it appears to be, if not indefinite, at least long enough to secure any economic advantages which this food could supply. A condition of relative immunity is probably acquired since none of our experimental animals died if they survived the first two months. On the other hand the poison of cotton-seed meal, when it produces symptoms at all, is evidently cumulative in its action, its effects being latent during the first month or more, abrupt and violent when they do appear."

Experiments with swine, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 72, 73*).—Continuing earlier work (E. S. R., 13, p. 1078) brief notes are given on the comparative merits of pasturing and soiling pigs, the green materials used being vetch and later rape. The grain fed in addition consisted of barley and middlings 3:1 during a greater part of the time. The pigs on pasture required 5.45 lbs. of grain per pound of gain and those fed in pens 5.47 lbs. Taking into account the fact that the pigs fed on pasture were superior at the start, the author concludes that inside feeding gave rather more economical gains.

"In each of 2 years, hogs pastured on rape, with a liberal allowance of meal, and hogs fed in pens, with a small allowance of rape, in addition to a full meal ration, gave bacon of excellent quality as to firmness.

"There seems to be no doubt that a moderate allowance of succulent food, such as clover, rape, vetches, or roots, has a beneficial influence upon the firmness of bacon."

The feeding of hay to pigs, A. E. MACLEOD (*Agr. Students' Gaz., n. ser., 11 (1903), No. 3, pp. 85, 86*).—The author states that he successfully employed chopped hay mixed with grain in feeding pigs in West Virginia. Wheat seeded down with timothy and clover or with clover alone, the latter being preferred, was followed by cut clover, and this by maize, the last crop in the rotation being oats.

The range hog as a forest problem, C. H. SHINN (*Forestry and Irrig., 9 (1903), No. 6, pp. 295–297, fig. 1*).—According to the author range hogs injure the seedling trees and pasturage in the Sierra forest reserves. The different plants eaten by the hogs are discussed.

Bacon curing as carried out at the Hawkesbury Agricultural College (*Queensland Agr. Jour., 12 (1903), No. 5, pp. 327, 328*).—Dry curing and brine curing of bacon are described.

A digest of recent experiments on horse feeding, C. F. LANGWORTHY (*U. S. Dept. Agr., Office of Experiment Stations Bul. 125, pp. 75*).—The principles of nutrition with especial reference to horses are discussed as well as the comparative value of feeding stuffs, methods of feeding, digestibility of feeding stuffs, watering, muscular work and its effect on food requirements, and related topics, the attempt being made to summarize available information on the subject, especially that afforded by the studies carried on at the experiment stations in the United States. Data were also collected showing the rations fed by express companies, cab companies, and others using large numbers of horses, and these rations are compared with those fed the farm horses of the experiment stations, army horses, etc.

Considering the data as a whole, the ratio by weight of coarse fodder or bulky feed to concentrated feed in the ordinary ration was found to be about 1:1. Crude fiber may perhaps be fairly considered as the characteristic constituent of coarse fodder. The ratio of crude fiber to protein in the average of a large number of American rations was found to be about 2:1.

From the available information it seems fair to conclude that, theoretically at least, any sufficient and rational mixture of wholesome grains, by-products, roots, and forage crops, green and cured, may be used to make up a ration, though there is a very general prejudice in favor of oats and hay, corn and hay or corn fodder, and barley and hay (frequently that made from cereal grains), the first-named ration being perhaps that most commonly regarded as satisfactory for horses. A corn ration is very commonly fed in the middle West and Southern United States—that is, in the corn-producing belt. The barley ration is quite characteristic of the Pacific coast region. In the semiarid regions of the United States Kafir corn and alfalfa have proved to be of great value, owing to their drought-resisting qualities. Both crops have been found useful for horse feeding. Of the two alfalfa has been used much more commonly, and has given very satisfactory results.

Horses require a considerable amount of water daily, the quantity varying with different seasons of the year, the amount of work performed, etc. The time of watering, whether before or after feeding, is a matter of little importance, and, generally speaking, may be regulated to suit the convenience of the feeder. Horses become used to either method of watering, and irregularity should be avoided, as sudden changes are apt to prove disturbing.

Judging by the average results, representing the practice of a large number of successful American feeders, and also the results of many tests at the experiment stations in different parts of the United States, horses with light work consume on an average a ration furnishing per day 0.99 pound of digestible protein and 14,890 calories of energy per 1,000 pounds live weight. Similar values for horses at moderate work are 1.49 pounds digestible protein and 22,710 calories.

Generally speaking, all these average values are less than those called for by the commonly accepted German feeding standards for horses performing the same amounts of work, yet from what is known regarding the American horses it seems fair to say that they were well fed.

Generally speaking, horses digest their feed, and especially the nitrogen-free extract and crude fiber in it, less thoroughly than ruminants.

Principles of horse feeding, C. F. LANGWORTHY (*U. S. Dept. Agr., Farmers' Bul. 170, pp. 44*).—The general principles of feeding are discussed with special reference to horses, and the results of recent experimental work, particularly that carried on at the experiment stations of the United States are summarized. The material in its present form is very largely an abridgment of the bulletin of the Office of Experiment Stations noted above.

Green food for farm horses (*Agr. Gaz. New South Wales, 14 (1903), No. 1, pp. 87, 88*).—The value of green feed for farm horses is insisted upon, alfalfa and sainfoin being considered the most useful. Methods of feeding green crops are briefly discussed.

Report of manager of poultry department W. R. GRAHAM (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 139–146*).—Brief statements are made regarding the poultry kept at the station farm, the eggs laid, and related topics. Considerable attention has been given to hatching hens' eggs and ducks' eggs with incubators, very poor results, it is stated, being obtained with ducks' eggs. The desirable characteristics for market poultry are also discussed and 3 feeding experiments are reported.

In the first test different breeds were compared when fattened in crates under uniform conditions. Twelve Barred Plymouth Rock cockerels, weighing together 37 lbs., gained on an average 2.1 lbs. each in 4 weeks, requiring 3.2 lbs. of grain per pound of gain. Eight high-grade Leghorns, weighing 18.25 lbs., made an average gain per fowl of 1.28 lbs., the grain required per pound of gain being 3.4 lbs. The ration fed to all consisted of barley meal, corn meal (or chop), shorts (or middlings), finely ground oats, and animal meal 2:2:2:1:1 mixed with about 1.5 times its weight of skim milk.

In the second test the merits of cooked food only (rolled oats, barley, and corn meal 2:1:1 fed with a cramming machine) was studied. In one instance 12 grade Plymouth Rock cockerels, weighing together 35.75 lbs., were fed 103 lbs. of the cooked feed (equivalent to about 34 lbs. of uncooked grain) in 2 weeks and made a total gain of only 5 lbs. "At the end of the 2 weeks the birds were very thin and sickly, their digestion being very bad. One of them died. The others were turned out on a grass run, and 2 of them died the second day they were out." The remainder improved in health after a time. After a week on raw feed the cooked grain mixture was given for 7 days to 12 Plymouth Rock chickens having a total weight of 62 lbs. They all lost in weight and 3 died. "The remaining 9 were placed on uncooked food the next week, and made a gain in weight of more than three-quarters of a pound each."

When the cooked grain was fed to a lot of 200 chickens for a week the majority lost in weight, although a few made small gains. A few of the best chickens were marketed, but were in poor condition and the test was discontinued.

"The chief difficulty with the cooked food appears to be that it damages the chicken's digestion. Some of the birds that were put on the grass run after being fed on cooked food, [had] not recovered . . . 3 weeks after being turned out. Cooked food can, no doubt, be fed to advantage in conjunction with raw food, but an all-cooked ration that is of a forcing nature appears to be entirely unsuitable for fattening fowls. These chickens were practically a total loss. Those that were turned loose never fully recovered."

In the third test, using 8 lots of 20 chickens each, the relative value of a mixed grain ration wet with whey, with skim milk, and with water was studied. In 2 cases in which the ration was mixed with water, animal meal, equivalent in amount to 12 per cent of the grain, was added before mixing. In one instance the grain and skim milk ration was supplemented by milk.

Considering the test as a whole, the lots fed grain mixed with skim milk, grain mixed with 12 per cent animal meal wet with water, and grain wet with skim milk and given milk to drink in addition made practically the same gains, namely, 20.5 lbs. per lot on the first, and 20 lbs. per lot on the last 2 rations mentioned. The smallest gain, 9 lbs., was made by the lot fed grain mixed with water. The grain required per pound of gain ranged from 2.45 lbs. with the lot fed grain wet with skim milk and given milk to drink in addition, to 7 lbs. in the case of the lot receiving the grain mixed with water. The cheapest gain, costing 3.9 cts. per pound, was made with the former lot and the most expensive, costing 9.8 cts., with the latter.

The author's principal conclusions were in effect as follows: Where a white skin is in demand for dressed poultry the skim-milk ration is the most satisfactory. The most economical gain was made when skim milk was given to drink, in addition to

the grain mixture being wet with it; but this mixture is not entirely satisfactory, as the chickens require very careful attention to keep them healthy. The grain ration to which 12 per cent animal meal was added, and the whole mixed with water, was very satisfactory, but the flesh has a yellowish tinge. The grain mixture wet with whey gave much better returns than was expected and it seemed to be fairly satisfactory. A grain mixture wet up with water is not to be recommended. All these rations, however, require further testing before definite conclusions can be reached.

Raising chickens, C. J. CALLOWAY (*Tuskegee Norm. and Inst., Farmers' Leaflet No. 14, pp. 8, figs. 7*).—Breeds, feeding, and other topics connected with chicken raising are discussed, and a few notes on farm management are given.

The egg-producing hen, T. E. ORR (*Missouri State Bd. Agr. Mo. Bul., 3 (1903), No. 2, pp. 16, fig. 1*).—The possibilities of profitable egg production are discussed with reference to breeds, feeds, etc., and statistics are quoted of the poultry and egg industry in Missouri and other States. The author briefly describes some experiments with laying hens conducted under his direction a number of years ago, and also quotes from work of the Utah Station previously noted (E. S. R., 12, p. 674).

Preservation of eggs, E. BROWN (*Jour. Bd. Agr. [London], 9 (1903), No. 4, pp. 494–497*) —Limewater, water-glass solution, and cold storage are said to be the best methods of preserving eggs. Some of the author's general suggestions follow:

"Eggs for preservation should be treated as soon as possible after they are laid, but not until they have been cooled. Eggs should not be treated in a warm place, and where limewater or water-glass is used the preparation should be quite cold before the eggs are placed in the solution. Eggs from hens fed chiefly upon grain, and with full liberty, are likely to keep better than those laid by fowls in confined runs. The general experience has been that infertile eggs keep in good condition longer than those which contain a living germ. Probably this is less apparent when eggs are preserved at a low temperature. When eggs are preserved in water glass or limewater the containing vessels should be stored in a cool place, at a temperature not less than 33° F., or more than 45°. A cool, sweet cellar is excellent for this purpose. Exposure to a higher temperature even for a few hours will cause deterioration, in spite of the preservative. Preserved eggs should be carefully tested by light before they are sold. The best months for preserving are March, April, May, and June. It has been found in many cases that summer eggs do not keep nearly so well as those laid prior to the hot days.

"Preserved eggs should be sold under that designation, and not as 'newlaids,' or 'breakfast,' or 'fresh' eggs."

About eggs, G. BRADSHAW (*Agr. Gaz. New South Wales, 14 (1903), No. 2, pp. 127–133, pl. 1*).—The development of eggs, their composition, and related topics are spoken of, as well as the local egg industry.

A modern ostrich farm, E. H. RYDALL (*Reliable Poultry Journal, 10 (1903), No. 4, pp. 440, 441, figs. 3*).—Ostrich rearing, feeding, and related topics are discussed.

Fish food, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 37, 38*).—Analyses are reported of a food for young trout and of beef liver, which is also used for the same purpose.

Two new textile fibers, G. SELLERGREN (*K. Landt. Akad. Handl. och Tidskr. 42 (1903), No. 1, pp. 35–41, pl. 1*).—A description of Aramina fiber from Brazil and of wool of the Swedish musk ox (*Ovibos moschatus*).—F. W. WOLL.

DAIRY FARMING—DAIRYING.

Vetch, cowpea, and soy bean hay as substitutes for wheat bran, J. F. DUGGAR (*Alabama College Sta. Bul. 123, pp. 51-72*).—In the first feeding experiment reported hairy-vetch hay was compared with wheat bran. The test was made with 2 lots of 3 Jersey cows each and lasted 8 weeks. The aim was to feed equal quantities of hay and bran in addition to a uniform basal ration. The results showed that 834.6

lbs. of hay was actually consumed in contrast to 890.4 lbs. of bran. The average waste in feeding vetch hay was 6 per cent, which was not included in calculating the results. At local prices for feeding stuffs, including wheat bran at $20 per ton and vetch hay at $10 per ton, the daily cost of the vetch ration per cow was 10.3 cts. and the bran ration 14 cts., making a difference of $1.11 per month in favor of the vetch ration. On the vetch ration the average yield per cow per day was 16 lbs. of milk and 1.03 lbs. of butter, and on the bran ration 15.8 lbs. of milk and 1.05 lbs. of butter, showing that the 2 rations were practically of equal value as regards milk and butter production. The estimated saving in cost of producing 1 lb. of butter on the vetch ration as compared with the bran ration was 3.4 cts., or 25 per cent.

In the second experiment, conducted on the same plan as the first, cowpea hay was substituted for wheat bran. As 16 per cent of the cowpea hay was rejected a greater amount was fed than that of bran. In 30 days 6 cows were fed 1,411 lbs. of cowpea hay, of which the quantity actually eaten was 1,176 lbs. Under the same conditions the bran eaten amounted to 1,097 lbs. On the cowpea ration the average daily yield per cow was 17.3 lbs. of milk and 1.13 lbs. of butter and on the bran ration 16 lbs. of milk and 1.02 lbs. of butter. With bran at $20 per ton and cowpea hay at $10 and including the waste in feeding cowpea hay the average cost of food for 1 lb. of butter was 12.3 cts. on the cowpea ration and 15.9 cts. on the bran ration, showing a difference of 23 per cent in cost. While the cowpea hay consumed was 7 per cent greater than that of bran, the yield of butter was increased 11 per cent. The waste in feeding cowpea hay was not decreased by running the hay through a feed cutter.

The 2 experiments showed that in rations containing 6 to 10 lbs. of concentrated feeds, vetch hay or cowpea was substituted for a part of the wheat bran with satisfactory results. The extent to which this substitution of leguminous hay may be carried is to be studied in future tests.

Two additional tests conducted for short periods are also reported. In one 6.8 lbs. of corn hearts, a by-product obtained in the manufacture of grits or hominy, was substituted for 7 lbs. of wheat bran, the results showing a difference of 7 per cent in milk production and 8 per cent in butter in favor of corn hearts. Soy bean hay was compared with cowpea, the waste in this test being, respectively, 32 and 22 per cent. On the basis of equal quantities actually consumed, soy beans produced 3.5 per cent more milk and 4.5 per cent more butter than cowpeas, the difference being fully counterbalanced, however, by the greater waste.

The digestible nutrients in the different rations fed in the experiments are given in tabular form.

From determinations made at different periods it was found that manure, including bedding, was produced by cows at the rate of 1,749 lbs. per month. Under conditions of continuous stabling 56.8 lbs., exclusive of bedding, was produced daily per cow. Practically one-half the manure was produced during a stabling period of 16 hours as compared with 8 hours out of doors.

Yield and fat content of milk from cows fed on mangels, J. Percival et al. (*Univ. Col. Reading Agr. Dept., Ann. Rpt. Field Trials and Expts. 1902, pp. 39, dgms. 8*).—An experiment was planned to compare the influence of 4 varieties of mangel-wurzels on the yield and quality of milk. The results were inconclusive so far as this object was concerned. They are, however, of interest in showing the yield and fat content of milk with intervals between milkings of 15 and 9 hours, respectively. Detailed data for 6 weeks are given for 8 cows milked at 6.30 a. m. and 3.30 p. m.

The percentage of fat in the milk was lowest in the morning or after the long interval. The milk of individual cows was below the legal standard of 3 per cent of fat on from 1 to 41 mornings out of 42, the average being about 26. On only 4 mornings did the mixed milk of the 8 cows contain 3 per cent or more of fat. The absolute yield of butter fat of 7 of the 8 cows, however, was greatest in the morning.

The yield of milk of individual cows was from 2 to 9 lbs. higher in the morning than in the evening.

Variation in the milk of a dairy herd during the winter months, T. S. DYMOND and B. W. BULL (*Essex Education Com., County Tech. Labs., 1903, Mar., pp. 19, dgm. 1*).—A detailed record is given of 4 Shorthorn cows from November 18 to February 28, together with weather conditions. The influence of food and weather upon variations in milk is discussed and the following conclusion is drawn: "Throughout this experiment the considerable variations in fat and solids have not been to any great extent due to alterations in food or alterations in weather, or to any external condition under which the cows were kept and which the dairy farmer could control. The important point is to recognize that these changes in quality are constantly taking place, but since they are not usually dependent on external conditions, but on the idiosyncratic variations of each cow, almost complete uniformity can be obtained by mixing the milk of a sufficient number of cows. In this experiment the mixing of the milk of 4 cows has been sufficient, but it would undoubtedly be desirable to mix the milk of a much larger number. How this can be carried out is a subject which must be left to practical men to discuss."

The covered pail a factor in sanitary milk production, W. A. STOCKING, JR. (*Connecticut Storrs Sta. Bul. 25, pp. 24, figs. 2*).—This is reprinted from the report of the station for 1901 (E. S. R., 10, p. 1007), with minor changes, including the addition of several diagrams.

Bacteria in milk and its products, H. W. CONN (*Philadelphia: P. Blakiston's Son & Co., 1903, pp. 306, figs. 43*).—This book, as stated in the subtitle, is designed for the use of students in dairying and for all others concerned in the handling of milk, butter, or cheese. Chapters are devoted to the nature of bacteria, sources of bacteria in milk, types of milk bacteria, growth of bacteria in milk, milk bacteria and health, protection of the consumer of milk products, bacteria in butter, bacteria in cheese, and the bacteriological analysis of milk. The great extent to which successful dairying is dependent upon bacteriology and the important relation of the milk supply to the dissemination of diseases make this thoroughly up-to-date work written in plain language exceedingly valuable. The book contains not only the results of recent progress along the lines discussed, but considerable new matter resulting from the author's own investigations. A bibliography of the more important recent literature, arranged topically, is appended.

Report of the professor of dairy husbandry, H. H. DEAN (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 56–68*).—Several lines of experiments in progress are reported upon.

Methods of handling milk for household purposes were compared, a scale of points being adopted for judging milk treated in different ways. In the first series of experiments the following was used: Smell 20, taste 25, acidity 30, depth of cream 15, appearance 10. In the second series the maximum for acidity was increased to 35 and that for appearance was reduced to 5. A vat of milk was divided into 6 lots, which were respectively clarified by running through a cream separator, pasteurized at 140° F., clarified at 140°, pasteurized at 160°, and clarified at 160°, one lot being kept for control. In the second series milk was also filtered. Pint samples of the different lots were placed in a refrigerator at 40° for 24 hours, and were then kept in a room at 70° for 3 hours, at the end of which period they were scored. After remaining at this temperature for 24 hours they were scored a second time. As regards depth of cream and appearance, normal and clarified samples led in both scorings. At the first scoring the highest average was obtained by milk pasteurized at 140° in the first series and 160° in the second series, and at the second scoring by milk pasteurized at 160° in both series. In these tests clarifying and filtering did not seem to have any advantage. "For customers who judge the value of the milk by the depth of cream and by its appearance, normal and clarified milk will suit best.

as the pasteurization of the milk prevents the cream from rising, and the bottle of milk does not present so pleasing an appearance. On the other hand, those who desire milk to remain sweet for 24 to 48 hours after delivery, especially if no refrigerator is convenient, and who wish to insure against disease germs in the milk, will find the pasteurized milk much better, especially that heated to 160°."

Measuring cream was compared with weighing. The measurements were made in inches in a pail 12 in. in diameter. Cream testing 15 to 20 per cent of fat was found to weigh 4.19 lbs. per inch; cream testing 20 to 25 per cent, 4.15 lbs.; cream testing 25 to 35 per cent, 4.10 lbs.; and cream testing 35 to 40 per cent, 4.07 lbs. The author recommends as a standard 4.1 lbs. per inch of cream, and that on the grounds of convenience in gathering for creameries cream should be measured instead of weighed. The use of the Babcock test is advised in preference to the oil test, which is reported as commonly used in cream gathering creameries in Ontario.

A vat of milk was divided into 4 portions, which were separated at temperatures of 85, 140, 160, and 180 to 185°. The different lots were ripened and churned separately and the butter was placed in cold storage and scored at the end of 1, 2, and 3 months. The experiment was repeated each month for 3 months. The butter from milk pasteurized at 180 to 185° stood first in quality, that from milk pasteurized at 160° second, and that from milk pasteurized at 140° third. The butter from unpasteurized cream was poorest. As the results of the present experiments in the pasteurization of milk for butter making confirm those previously obtained, it is intended to discontinue this line of work. The following conclusion is drawn: "Butter made from milk heated to 180 to 185° possesses undoubted keeping qualities not obtained by separating at ordinary temperatures, nor by heating to temperatures ranging from 140 to 160°. For export butter, pasteurization of the milk or cream at a temperature of from 180 to 185° is a decided advantage. Pasteurization is also advisable when making butter to place in cold storage."

In all, 44 experiments were made in ripening cream at temperatures from 55 to 80°. There was very little difference in the quality of the butter made from cream ripened at the different temperatures. In general, however, a temperature of 65° was found most satisfactory. In experiments made during the summer, lots of cream were divided into groups containing 0.4 to 0.5 per cent of acid, 0.5 to 0.6 per cent, 0.6 to 0.7 per cent, and 0.7 to 0.8 per cent. The butter made from each group was scored from 2 to 4 weeks after making and again a month later. "There was not much difference in the flavor of the butter in the different groups at the first scoring, but at the second scoring the samples made from cream with high acidity appeared to lose flavor more than those with low to medium acid, 0.4 to 0.6 per cent. It is altogether likely that the acid may vary considerably in cream without materially affecting the quality of the butter. For 'keeping butter' it is not advisable to have more than 0.6 to 0.7 per cent acid in cream testing 25 to 35 per cent fat."

The average results of 32 trials in making butter from cream containing different percentages of fat showed a score for flavor of 40.8 for cream testing 15 to 20 per cent of fat, 41 for cream testing 20 to 25 per cent, 40.9 for cream testing 25 to 30 per cent, 40.6 for cream testing 30 to 35 per cent, 41 for cream testing 35 to 40 per cent, and 40.5 for cream testing 40 to 45 per cent, the maximum score being 45. There was also very little difference in the keeping quality of the different lots of butter.

Data are given for experiments on the effect of churning, washing, draining, salting, and working butter upon the content of moisture and salt, from which conclusions are drawn varying in some respects from the results of earlier work along this line.

"There was little or no difference in the moisture and salt contents of the butters, whether churned to the size of wheat or of corn grains. In 1901 the samples churned to the size of corn grains contained the highest percentage of moisture and salt.

"The moisture and salt in the finished butter was very similar, whether washed with brine or with water. There was also little or no difference in the quality of the butter.

"The lots drained before salting at the rate of ¾ oz. salt per pound of fat in the cream, contained less moisture, and within one-half of 1 per cent the same amount of salt as lots not drained and salted 1 oz. per pound of fat in the cream.

"The unsalted samples contained an average of 13.239 per cent moisture. Those salted at the rate of ½ oz. salt per pound butter contained 12.996 per cent of moisture and 1.84 per cent salt. The lots salted 1 oz. per pound of butter contained an average of 13.562 per cent of moisture and 3.64 per cent of salt. In 1901, the unsalted butter contained the least moisture, in 1900 the most moisture, and this year it takes a medium position. The results indicate that the moisture content in unsalted butter is not necessarily higher than that in similar butter salted.

"Butter worked once, twice, and three times contained, respectively, 12.541, 12.246, and 11.759 per cent of moisture, and 3.65, 3.31, and 2.62 per cent of salt.

"Samples worked slightly before salting and then salted from one-half to three-quarters of an ounce per pound of butter had 13.791 per cent moisture and 3.41 per cent salt, while similar lots treated in the usual way and salted 1 oz. per pound of butter contained 13.995 per cent moisture and 4.06 per cent salt.

"The amount of moisture in the finished product is largely determined by the working which it receives. The salt depends upon the amount of salt added, the moisture in the butter at the time of adding the salt, and the amount of working given to the butter."

Experiments in ripening cheese are noted below from the report of the chemist.

Heating curds made from overripe milk to 110° instead of 98°, especially when combined with washing the curd after milling to remove the excess of acid, was found in preliminary experiments to give good results as regards the flavor and texture of the cheese.

Curds were washed after dipping in water at 98°, equal in quantity to the weight of the curd in one series of experiments and to twice the weight of the curd in another series. Similar experiments were made in washing curds after milling. From the results of the present and earlier work the following conclusion is drawn: "After 3 seasons of careful work, we find it no advantage to wash all curds, and it tends to cause loss of valuable cheese-making material. It also tends to produce 'open' cheese. Curds having a bad flavor or those having too much acid are benefited by washing, but to advise the washing of all curds we consider a mistake on the part of those advocating this method."

Determinations of the moisture in curd at the time of dipping and milling and in green and cured cheese are reported in tabular form. Several variations in the method of manufacture are noted. The work is noted as preliminary to further investigations along this line.

In continuation of experiments reported in 1901, 18 comparative tests were made of ripening cheese in well-lighted and dark rooms, the results for both years showing little difference in the quality of the cheese or loss in weight as regards light, so long as the temperature and moisture are favorable.

Cheeses were coated with paraffin as soon as taken from the press and after periods of 1, 2, and 3 weeks, and compared with uncoated cheese as regards quality and loss in weight. Two series of experiments are reported, from the results of which the following conclusion is drawn: "Dipping cheese in hot paraffin wax when about one week old prevents loss of moisture and adds somewhat to the appearance of the cheese, but does not prevent the growth of mold. The cheese ripened in an ordinary curing room and coated with the wax was poorer in quality in one series and better in the other. In cold storage the quality was slightly better as a result of paraffining. Whether or not it will pay to coat cheese with paraffin wax is a ques-

tion not settled yet. If paraffining is done, the best results are got by coating when cheeses are about one week old."

The average yearly production of the 20 cows in the dairy herd was 6,673 lbs. of milk and 250.87 lbs. of fat.

Water in butter, R. Harcourt (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 38, 39*).—A sample of butter sold in Toronto at the regular market price was found upon examination to contain 53.15 per cent of water, 41.21 per cent of fat, 1.50 per cent of curd, and 4.14 per cent of salt. The butter apparently contained no foreign fats. "The chief fault to be found with the butter was its abnormally high water content. No doubt it had been treated with one of the so-called nostrums, which have made it possible for the dealer to make a handsome profit in selling water at 20 and 22 cts. per pound."

Does the amount of nitrogenous matter in butter affect its keeping quality? R. Harcourt (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, p. 39*).—The percentages of nitrogen in a number of samples of butter made in different ways were determined for the purpose of obtaining data that would help to answer this question. The results, while not conclusive, are considered as indicating that the presence of more or less nitrogenous matter in butter does not necessarily affect its keeping quality.

Reports of experiments to determine the causes of the low percentage of volatile fatty acids in Netherland butter (*Verzamel. Verslag. Rijk Gesubsidiëerde Proefvelden, etc., 1901–2, pp. 1405–1543, dgms. 12*).—This consists of a series of reports by the directors of the different stations.

Report of K. H. M. van der Zande on the work in North Holland (pp. 1406–1426).—Experiments were made to determine the effect of early stabling to protect cows from unfavorable weather and also to determine the effect of changes in food. Four groups of cows were used, the first and second being stabled October 7, while the third and fourth remained on pasture. Of the 2 groups in the stable, the first was fed on freshly cut grass taken from a field precisely similar to that on which group 3 was pastured. Group 2 received the regular winter ration of hay and linseed meal. Groups 3 and 4 remained out of doors until December 14, group 3 having pasturage only, while group 4 received linseed meal in addition. Samples of milk were obtained each week, from which butter was made. Early stabling was found to be harmful and to lower the percentage of volatile fatty acids. The change of food, together with early stabling, was even more harmful than early stabling alone. The addition of linseed meal to the pasture feed also resulted in a decrease in the percentage of volatile fatty acids.

Report of M. H. M. van der Zande on the work in Friesland (pp. 1427–1473).—These experiments were carried on at 6 places in Friesland, at each of which 2 adjoining farms as nearly alike as possible were selected. At each place the cows on one of the farms were stabled early, on the other late. The food given after stabling was the ordinary ration. The results of all the tests show that the average decrease in the percentage of volatile fatty acids was as great for the cows stabled early as for those stabled late.

Report of B. Sjollema on the work in Groningen (pp. 1474–1514).—The experiments in this province were designed to determine if the method of ripening cream in butter making exerts any influence on the percentage of volatile fatty acids, the effect of adding a concentrated feed to pasturage and also the effect of sheltering cows at night during the fall, and the effect of feeding beet tops. It was found that the method of ripening the cream had no influence on the percentage of volatile fatty acids in the butter. In regard to the effect of stabling cows at night to protect them from the weather it was found that in case the decrease in volatile fatty acids was slight, such protection might check a further decrease, but that the effect was unimportant and unreliable. The character of the food was shown to have great

influence. Butter from cows fed on young fresh growth, as young clover, had a decidedly higher percentage of volatile fatty acids than butter from cows fed on rather worn-out grass land. The addition of linseed meal to pasturage had an injurious effect, but when all the cows were subsequently turned on young clover those that had been fed linseed meal showed a more marked improvement than the others. It was found that the time when the percentage of volatile fatty acids decreased corresponded with the time when the growth of the grass ceased. The individuality of each cow is believed also to be an important factor in determining the percentage of volatile fatty acids in butter. The experiments on the effect of feeding beet tops were made with 4 cows. Two of the cows on pasture were fed beet tops ad libitum and one week later beet tops were also given to the other 2 cows. The effect of the beet tops was apparent at once in an increase in the yield and fat content of the milk and in the percentage of volatile fatty acids in the butter. To determine what constituents in the beet tops caused the favorable results 6 cows were divided into 3 groups, group 1 being fed beet tops, group 2 sugar beets, and group 3 barley meal. After receiving beet tops for several days, group 1 was fed beet leaves alone for 1 week. The milk from this group showed at first a slight decline in the volatile fatty acids, followed by a sudden drop at the time when the cattle received only beet leaves. The results with group 2 showed a great increase in the percentage of volatile fatty acids, followed by a decrease as soon as the cows were again fed beet tops. The feeding of barley meal to group 3 resulted in a decrease in the volatile fatty acids, followed by an increase when the cows were fed beet tops. Two groups of cows were also fed molasses or unrefined sugar, the results showing a marked increase in the volatile fatty acids in the butter. The results of the tests as a whole indicate that the sugar in the beet was the cause of the increase in the volatile fatty acids.

Report of D. A. J. Swaving on the work in Zeeland (pp. 1515–1535).—The conclusions reached in these experiments were, that late pasturing decreases the amount of volatile fatty acids in the butter due largely to the poor condition of the pasture, that stabling alone will maintain the percentage of volatile fatty acids, that a change of feed at once affects the composition of the butter fat, and that by proper additional feed it is possible to maintain a satisfactory content of volatile fatty acids in butter even with late pasturing.

Report of J. J. L. van Rijn on work at Limburg and North Brabant (pp. 1535–1543).—The butter made in these provinces during the fall months has a higher percentage of volatile fatty acids than is found in the butter made in the northern provinces, and the author is convinced that this is due to differences in the methods of feeding. Information collected from a large number of factories as regards methods of feeding cows and handling the milk constitutes the main part of this report.—H. M. PIETERS.

Investigations regarding the ripening of cheese, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 40, 41*).—Some of the results obtained in investigations of the chemical changes taking place in casein during the ripening of cheese at different temperatures are briefly reported. Once each month, from April to November 2, cheeses were made under uniform conditions from the same vat of milk, one of which was cured in cold storage at 38 to 40° F. and the other in the ordinary curing room at 65°. The percentage of casein soluble in water was determined at frequent intervals. Cheese made in June, July, and August ripened much more rapidly than cheese made in April and May. This was true not only in the case of cheese ripened in the curing room but also of cheese ripened in cold storage where the temperature remained uniform. Cheese kept in cold storage from the last of April to the middle of August ripened much more rapidly upon being transferred to the ordinary curing room. No corresponding check in the rate of ripening, however, was observed in the case of cheese transferred at the same time from the curing room to cold storage. The results so far obtained in the investigations in progress indicate that cheese will ripen about as much during 1 month in the ordinary curing

room as during 4 months in cold storage. A fuller report is promised upon the completion of the studies.

Annual reports of the dairymen's associations of the Province of Ontario, 1902 (*Ontario Dairymen's Assocs. Rpts., pp. 224*).—Among the large number of subjects discussed at the two meetings held, mention may be made of the following: Cheese Making, by G. G. Publow, G. H. Barr, and others; Injurious Flavors in Cheese, by F. C. Harrison; Organized Effort for the Promotion of the Dairy Industry in the United States, by H. E. Alvord; Cool Curing of Cheese, by J. A. Ruddick and R. M. Ballantyne; Rennet, Hot Iron, and Acidimeter Tests in Cheese Making, by H. H. Dean; Butter Making, by H. H. Dean, A. Smith, W. Waddell, J. W. Hart, and others; Work of the Experimental Farms, by W. Saunders; Bacteriology in Relation to Dairying, by W. T. Connell; Analysis of Cheese, by T. Macfarlane; Transportation of Dairy Products, by J. W. Robertson; Government Relations to the Dairy Industry in the United States, by H. E. Alvord; Ontario Agriculture, Past and Present, by C. C. James; and Water Content of Canadian Creamery Butter, by F. T. Shutt.

VETERINARY SCIENCE AND PRACTICE.

Experimental studies on bacterial antagonism, A. Lode (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 3, Orig., pp. 196–208, figs. 8*).—Attention is called to the evident antagonism between different bacteria, as thus far observed in cultures by various investigators. A similar antagonism was found to exist between the filtered metabolic products of these bacteria. The active principles in this antagonism may be utilized. Detailed notes are given on the behavior of antagonistic bacteria when cultivated close together on the same medium. Experiments were made on the animals to determine whether the metabolic products of bacteria could be utilized for curative or preventive purposes. These experiments were made on mice and gave entirely negative results, so that little is expected from this method.

Some observations on the protective bodies and on their relation to bacterial virulence, E. W. A. Walker (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 4, Orig., pp. 297–311*).—The author's experiments were chiefly confined to rabbits and the organism used was the typhoid bacillus. It was found that the amount of the complement present in the serum varies from hour to hour after the blood is shed and suddenly increases during the first few hours if the serum is left in contact with the blood clot. The complement does not belong so strictly to a given species of animal, but the deficiency may be made good by means of a complement from another species. The virulence of a bacillus was found to be increased by passage through bacteriolytic fluids in vitro.

The mechanism of agglutination, A. Joos (*Ztschr. Hyg. u. Infectionskrank., 40 (1902), No. 2, pp. 203–230*).—The results of investigations reported in this article may be summarized as follows: The agglutinable substance when mixed with the agglutinating substance combines with the latter without any macroscopic or microscopic alteration by which the operation can be detected. Micro-organisms which are modified in this way remain free and motile. Agglutination immediately results, however, if a trace of salt is added. The volume of the precipitate obtained stands in strict relation with the quantity of salt and serum added to the mixture. The function of the salt, therefore, is not a passive one; it actively assists in forming a combination between the agglutinable and agglutinating substances. A characteristic agglutination may be obtained in a fluid free from salt, provided that the bacteria contain salt. It was found during these experiments that the same results might be obtained from the use of a considerable variety of salts in addition to sodium chlorid.

Introduction to serum diagnosis, E. Marx (*Ztschr. Thiermed., 6 (1902), No. 5–6, pp. 388–418*).—A general account of the various bodies which have been obtained

from animal sera, and of the use of bactericidal immune sera, agglutinating sera, antitoxic and precipitating sera.

Organotherapy, E. Joest (*Ztschr. Thiermed., 7 (1903), No. 1, pp. 17-40*).—A general outline of the essential features of this method of treatment and of the results which have been obtained from its application in various diseases. The literature of the subject is critically discussed. Special attention is called to the use of extracts from the thyroid glands, reproductive organs, pancreas, and suprarenal bodies. The author believes that work thus far accomplished in this field of medicine has shown that there is an interdependence between the whole organism and different kinds of cellular tissue and that each kind of tissue performs a function which is of direct benefit to all other kinds of tissue. It has also been shown that certain functions may be much stimulated by the artificial introduction of extracts prepared from certain organs of the same or different species in the treatment of certain diseases.

The first Pan-Russian congress of veterinarians in St. Petersburg (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 1, pp. 1-25*).—This congress held its meetings in St. Petersburg January 3-12, 1903. An organization committee had been working toward this end for the past year and succeeded in bringing together a considerable number of veterinarians, by whom a scientific and social programme was presented. The good wishes of the Czar were presented to the congress by Prince Constantinovich. The purpose of the meetings was outlined by the chairman of the organization committee, and a number of papers were read, among which the following may be mentioned: A Short Historical Account of Veterinary Work in Russia, by A. P. Otapenko; The Present Status of the Question of Tuberculosis, and the Relationship between Human and Bovine Tuberculosis, N. N. Mari; and The History of the Development of the Tubercle, Its Morphology and Biology, by K. Z. Kleptzov.

Reports of inspectors of stock for year ended March 31, 1902, T. A. Fraser et al. (*New Zealand Dept. Agr. Rpt. 1902, pp. 1-98, pls. 4*).—As usual in these reports of inspectors, detailed notes are given on the numbers of animals in the different parts of New Zealand, the condition of the pastures, and the prevalence of animal diseases. Brief accounts are also presented of the injuries to agriculture by birds and rabbits.

Report of the chief inspector of stock, J. R. Weir (*Jour. Dept. Agr. Victoria, 1 (1902), No. 8, pp. 774-784*).—Notes on the condition of stock and the prevalent diseases in various parts of Victoria. The diseases noted by the various inspectors include pleuro-pneumonia, tuberculosis, actinomycosis, anthrax, "yambuk disease," etc.

Report of the spaying expert, D. Wilson (*Jour. Dept. Agr. Victoria, 1 (1902), No. 8, pp. 819-821*).—In a total of 4,866 animals spayed by the author the loss amounted to 1 per cent. Spaying is recommended for good milch cows after they reach an age of 9 or 10 years. Notes are also given on caponizing of poultry and castration of other animals.

The occurrence of bacteria in the lungs and bronchial glands of live animals, U. Quensel (*Ztschr. Hyg. u. Infectionskrank., 40 (1902), No. 3, pp. 505-521*).—The author's observations were made on sheep, calves, horses, and hogs killed in abattoirs and passed as healthy after inspection. The lungs were examined from 16 calves, 15 sheep, 5 horses, and 6 hogs, and detailed notes are given on the organisms found in the lungs and bronchial glands. A considerable variety of bacteria were isolated from these organs and the author concludes that the majority of these organisms were present in the lungs during life and during a healthy condition of the animals. It is believed that these organisms are nearly if not quite always present, although in small numbers, in the lungs of healthy animals. Similar conclusions are drawn with regard to the bronchial glands, in which various organisms were found during a normally healthy condition of the animal.

Cryptogenetic sepsis in young animals, H. KABITZ (*Ztschr. Fleisch- u. Milchhyg., 13 (1902), Nos. 2, pp. 41–46; 3, pp. 80–82*).—A careful study of a number of forms of this disease was made and the conclusion was reached that cryptogenetic sepsis in the majority of cases is the result of infection through the umbilicus. The infection frequently takes the form of a gastric disease. Placentar infection is possible but has not been demonstrated. In some cases cryptogenetic sepsis is the sequela of septic pneumonia.

Husk, hoose or parasitic disease of the lungs of cattle, sheep, and pigs, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 22 (1903), No. 2, pp. 153–157*).—In Cape Colony the worm which causes this disease in sheep and goats is *Strongylus filaria;* pigs are affected with parasitic bronchitis due to the presence of *S. paradoxus;* while *S. micrurus* causes lung disease in calves. Notes are given on the symptoms, etiology, and treatment of this disease. Many remedies were tried in the treatment of the disease. It was found that kerosene oil produced good effects when given in doses of a teaspoonful to lambs and pigs and a tablespoonful to calves. Turpentine was also beneficial in similar doses. It should be mixed with milk or oil. Intratracheal injections were used with good results. One of these injections contained turpentine, chloroform, carbolic acid, and olive oil, and the other contained black poppy oil, oil of turpentine, carbolic acid, and purified cade oil.

Infectious epithelioses and epitheliomata, A. BORREL (*Ann. Inst. Pasteur, 17 (1903), No. 2, pp. 81–122, pls. 6*).—A number of related diseases were made the subject of the author's investigations, including sheep pox, cow pox, smallpox, acne, foot-and-mouth disease, cattle plague, and epitheliosis of mice. From a histological study of the lesions observed in sheep pox it is concluded that there is a characteristic and specific element in this disease, viz, a sheep pox cell with vacuolated nucleus having a pseudoparasitic content. When the localization of the sheep pox occurs the process appears to begin with the mesodermic lesion accompanied with a proliferated epithelial reaction and terminating, after a certain period, with cellular vacuolation. The process exhibits the same type in the skin, lung, liver, and kidney. There is a production of epithelial tumors developed at the expense of preexisting elements of the organ. In sheep pox lesions of the serous membranes there may be very minute granulations scattered in the edematous tissue. As a result of a critical comparison of the various epithelioses discussed by the author it is concluded that cancerous diseases do not constitute a pathological group absolutely different from and without analogy to infectious diseases. The author's study of epithelioses has convinced him that the virulent organism of this disease may pass through filters, and should therefore be classified with the smaller micro-organisms.

Human and bovine tuberculosis, N. RAW (*British Med. Jour., 1903, No. 2202, pp. 596–598*).—The author had under his observation more than 2,000 cases of pulmonary tuberculosis in man and witnessed more than 500 autopsies on cases of tuberculosis. From the clinical and pathological observations thus made he is inclined to believe that primary intestinal tuberculosis and other tuberculous infections of the serous membranes in children are probably cases of bovine tuberculosis produced by milk and are not related to human tuberculosis. The author discusses the symptoms of tabes mesenterica, scrofula, tuberculous meningitis, and post-nasal adenoids. The author believes that "human and bovine tuberculosis are separate and distinct diseases, as shown by Professor Koch, but that the human body is susceptible to both, and especially to bovine tuberculosis in the early periods of life." Since the 2 diseases are so rarely seen together, it appears in the opinion of the author to be reasonable to suppose that they are mutually antagonistic to each other and that bovine tuberculosis may perhaps confer immunity against human tuberculosis. As a preventive remedy against bovine tuberculosis the author recommends thorough pasteurization of all milk consumed by young children.

Recent evidence as to the identity of human and bovine tuberculosis (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 387–395*).—A brief critical review of some of the more important literature relating to this controversy. It is stated that in England the laws regarding the sale of tuberculous meat and milk have not been any less rigidly enforced since the publication of Koch's address. This statement is made on account of a contrary statement at the Berlin Conference to the effect that great laxity in this regard had been observed during the past year or two.

Tuberculosis of man and cattle, O. Stenström (*Ztschr. Thiermed., 6 (1902), No. 4, pp. 289–291*).—The author made a number of experiments in inoculating calves with the sputum of tuberculous patients. The results of these experiments are opposed to those of Koch, since in certain cases a true infection of tuberculosis with a tendency to become generalized was produced.

Professor Koch, and the danger from bovine tuberculosis, P. Garnault (*Le Professeur Koch, et le péril de la tuberculose bovine. Paris: Institut International de Bibliographie, 1902, pp. XXX + 1062, figs. 10*).—In this volume the author presents a brief account of an attempt which he made to inoculate himself in the arm with tubercle material of bovine origin. The greater part of the volume is of a highly controversial nature, in which the author argues against the proposition of the dual nature of tuberculosis, as proposed by Koch, and seeks to disparage the latter's scientific attainments, personality, and ethical principles. A bibliography of the literature relating to this controversy, and published since the delivery of Koch's address, is appended to the volume.

The specific nature of serum diagnosis of tuberculosis, P. Eisenberg and E. Keller (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 7, Orig., pp. 549–567*).—The literature of serum diagnosis in the investigation of tuberculosis is critically discussed, in connection with a bibliography of 88 titles. The observations made by the authors on human patients and numerous investigations on experimental animals indicate that serum reaction can not be depended upon in the diagnosis of tuberculosis. It was found that the serum reaction was negative in 30 per cent of active cases of tuberculosis.

Directions for making protective inoculation against tuberculosis in cattle, E. von Behring (*Ztschr. Thiermed., 6 (1902), No. 5–6, pp. 328–335*).—Notes are given on the best method for selecting cattle for the experiment, numbering the cattle, taking temperature, preparing and measuring the inoculation material, and the technique of inoculation and subsequent hygienic care of the cattle and stalls.

Jennerization as a means of combating bovine tuberculosis in agricultural practice, E. von Behring (*Ztschr. Thiermed., 6 (1902), No. 5–6, pp. 321–327*).—The author makes a further report upon the experiments already referred to (E. S. R., 14, pp. 393, 394). It is now considered as demonstrated that cattle vaccinated according to the method of the author are immune against infection with bovine tubercle virus of sufficient strength to produce fatal results in control cattle.

Histological changes after the injection of dead tubercle bacilli, G. Engelhardt (*Ztschr. Hyg. u. Infectionskrank., 41 (1902), No. 2, pp. 244–256*).—The present discussion deals with the controversy as to whether the injection of dead tubercle bacilli can produce typical tubercles with ultimate caseation of the interior. It is believed that the irritation produced by the dead tubercle bacilli is chiefly chemical rather than mechanical. The reasons for this belief, as stated by the author, are that a desquamative pneumonia is observed in the lungs of experimental animals after injection with dead tubercle bacilli and that this process closely resembles that which occurs in infection by living tubercle bacilli. Tubercles produced by dead tubercle bacilli were observed 80 days after the beginning of their formation, and a fibrinoid substance was not found in the center in any case, and no sign of caseation was observed.

Combating tuberculosis on the basis of herd records for over fifty-nine years, T. Hermann (*Ztschr. Thiermed., 6 (1902), No. 5–6, pp. 336–368*).—On an

estate near Bautzen 114 cases of tuberculosis occurred among cattle during the years 1842–1901. The relationship of heredity to the development of these cases was studied from the records kept concerning the herd. Among these various cases it was found that not a single one occurred which had not been subjected to one or another of the most important predisposing causes of tuberculosis.

In order to prevent the development of tuberculosis among herds of cattle the author considers it of chief importance to avoid the presence of these predisposing causes. The 4 chief causes of this sort as outlined by him are the use of the last of a large number of offspring by common parents, lack of ventilation, in-and-in breeding, and tuberculous parentage.

Tuberculosis in horses, H. MARKUS (*Ztschr. Thiermed., 6 (1902), No. 5–6, pp. 369–387*).—The author made a detailed study of this disease in 15 horses. It was found that the disease assumes a number of forms in the lungs of horses and that a distinction could readily be made between primary and secondary forms, or, in other words, between aspiratory and embolic tuberculosis. The author believes that the mode of infection is the only basis upon which the different forms of pulmonary tuberculosis can be classified.

Tuberculosis in cold-blooded vertebrates, L. TERRE (*Essai sur la tuberculose des vertébrés a sang froid. Dijon: Barbier-Marilier, 1902, pp. 128*).—The literature relating to tuberculosis in cold-blooded vertebrates is critically reviewed in connection with a bibliography of 168 titles. A bacillus was isolated from dermal tubercles in carp and this organism was studied with special regard to its relationship to the bacillus of Koch. The organism is called by the author the bacillus of carp. The diseases produced in carp by this organism resemble in all particulars the typical tubercular lesions caused by the bacillus of Koch in warm-blooded animals. The organism itself appeared to be identical with the bacillus of Koch in all of its morphological characters. When inoculated into fish, amphibia, or reptiles, the bacillus of carp caused typical tubercles which showed necrosis and caseation.

Experiments with tubercle bacilli from mammals and birds indicate that these organisms could be gradually transformed into the bacilli of carp by passing through cold-blooded vertebrates. This transformation constitutes, in the opinion of the author, a new argument in favor of the identity of the various forms of tuberculosis. When injected in moderate doses the bacillus of carp is not pathogenic for warm-blooded animals, but produces lesions of a regressive character. The soluble products and extracts from the bacillus of carp possess similar properties to those of the bacillus of Koch. The organism as obtained from fish was found to be susceptible to agglutination by the serum of tuberculous warm-blooded animals. It is believed by the author that the organism studied by him is identical with that found by Moeller in the blindworm.

Tuberculous ulcerations on the face of cats, G. PETIT (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 22, pp. 651, 652, fig. 1*).—Notes on the symptoms and pathological anatomy of a tuberculous affection of the skin on the face of cats. The retropharyngeal and other lymphatic glands of the head were swollen and infected.

A new method for intensive staining of the tubercle bacillus, BIOT (*Ann. Acad. Macon, 3. ser., 6 (1901), pp. 85–91*).—In obtaining an intense coloration of tubercle bacilli the author found it desirable to use a mordant in connection with the staining method of Ehrlich or that of Ziehl. The preparations are immersed in a solution of formalin; they are then placed in a fuchsin bath slightly carbolized, to which a few drops of formalin have been added.

Actinomycosis of the tongue of cattle, together with alterations in the lymphatic glands of the head and lungs, H. HOHMANN (*Ztschr. Fleisch u. Milchhyg., 13 (1902), No. 1, pp. 14, 15, fig. 1*).—Notes on the pathological anatomy of cases of wooden tongue, and on the condition of the lymphatic glands in such cases.

Staining actinomyces in sections, S. CIECHANOWSKI (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 3, Orig., pp. 238, 239*).—Great difficulties have been experienced

in staining actinomyces in sections successfully. The author outlines a method which in his hands has given excellent results.

Anthrax, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 22* (*1903*), *No. 3, pp. 293–300*).—Brief notes on the nature, source of infection, symptoms, and treatment of this disease.

The diagnosis of anthrax, E. GOTTSTEIN (*Hyg. Rundschau, 12* (*1902*), *No. 23, pp. 1185–1193*).—Brief notes are given on the various means by which anthrax bacilli may be identified under the microscope or by means of inoculation experiments, and attention is called to the desirability of destroying all material which may contain anthrax bacilli and of disinfecting the premises after an outbreak of this disease.

Anthrax, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, p. 94*).—During the season of 1902 a number of reports were made of this disease and attention is called to the dangers which are incurred from not taking strict measures in the eradication of the disease and burning or burying of carcasses.

Treatment of anthrax with carbolic acid, A. MINDER (*Schweiz. Arch. Tierh., 44* (*1902*), *No. 6, pp. 267–271*).—The author administered a 0.5 per cent solution of carbolic acid in water in frequent doses so as to aggregate 40 to 50 liters during 24 hours. During the crisis of the disease doses of 1.5 liters were administered every 15 minutes. The condition of the affected cattle improved quite rapidly in all cases and recovery took place ultimately.

The antianthrax properties of rabbit and dog sera, O. BAIL (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 5, Orig., pp. 343–353*).—It was found during a long series of experiments that dog serum which had been shown to be perfectly inactive toward anthrax could be given very active properties toward anthrax by the addition of minute quantities of rabbit serum. The effect of rabbit serum was noticeable even when added in the proportion of 1 to 1,000. The author discusses at considerable length the theoretical bearing of this experiment. Other experiments showed that the serum of the sheep may be influenced in a similar manner by the addition of rabbit serum.

The destruction of carcasses of animals dead of anthrax, E. ZSCHOKKE (*Schweiz. Arch. Tierh., 44* (*1902*), *No. 6, pp. 283–292*).—Attention is called to the danger from the distribution of anthrax by means of carcasses of animals dead of the disease. It is urged that in all cases where the presence of spores on the outside of the carcass is possible, the whole carcass should be thoroughly incinerated.

An experiment in steam sterilization, C. EIJKMAN (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 7, Orig., pp. 567, 568*).—Live steam under low pressure was found to be much more effective in destroying *Bacillus pyocyaneus* and anthrax spores than was boiling water. The explanation of this difference in the effect of live steam and boiling water is believed to be found in the fact that the boiling point of water is increased by the presence of soluble materials, such as salt and sugar, while the steam is not thereby influenced.

Foot-and-mouth disease in New England, J. W. CONNAWAY (*Bul. Missouri State Bd. Agr., 2* (*1903*), *No. 11, pp. 44, figs. 7*).—The author was detailed by the Missouri State board of agriculture to investigate the extent of the outbreak of foot-and-mouth disease in New England and to advise the board as to the necessity of any quarantine action against cattle from New England. The results of the author's investigations indicate that the work of eradicating the disease is being vigorously prosecuted and that live stock in Missouri are in no apparent danger of infection. Notes are given on the symptoms, etiology, period of incubation, and rate of mortality and fatal consequences of this disease. In order to prevent unnecessary excitement among cattle owners attention is called to the differences between contagious foot-and-mouth disease on the one hand and ergotism and mycotic aphthous fever on the other. Both of the latter diseases occur from time to time in Missouri and neighboring States, and have occasionally been mistaken for foot-and-mouth

disease. The origin of the present infection in New England has not been definitely determined. The disease has been observed in 75 towns in Massachusetts and neighboring States, and the authorities have killed 1,848 cattle in order to check the spread of the disease. In this work the Bureau of Animal Industry of this Department and the board of cattle commissioners of Massachusetts have cooperated. Cattle are slaughtered and buried in deep trenches after being sprinkled with lime or other disinfectants, or in some instances have been burned. The indemnity paid for animals thus killed is 70 per cent of the appraised value.

Foot-and-mouth disease, C. W. Gay (*Iowa Agr., 2 (1903), No. 7, pp. 170–173*).—Notes on a recent outbreak of this disease in New England, with a brief statistical account of the animals slaughtered by this Department and the appraised valuations and compensation paid for slaughtered animals.

Foot-and-mouth disease, N. S. Mayo (*Industrialist, 29 (1903), No. 25, pp. 397, 398*).—Brief notes on the symptoms, pathological anatomy, and treatment of this disease.

The treatment of foot-and-mouth disease, F. Lieutaud (*Jour. Agr. Prat., n. ser., 5 (1903), No. 7, p. 218*).—In the author's experience cauterization and other antiseptic treatment of wounds and the use of protective serum were without results in the treatment of this disease.

Contagious pleuro-pneumonia of cattle, D. Hutcheon (*Agr. Jour. Cape Good Hope, 22 (1903), No. 3, pp. 319–322*).—The author recommends as the quickest and shortest method of eradicating this disease that all animals which have been directly exposed to infection should be slaughtered. It is suggested that in order to induce the natives to consent to the slaughter of their cattle, they might be granted permission to eat the meat after the internal organs had been removed and destroyed.

Parturient paresis, F. W. van Dulm (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 3, pp. 111, 112*).—A test was made of the efficacy of the method of pumping air into the udder in cases of this disease. Good success was had and it was found that the greater the pressure produced inside the udder the more rapid was the recovery.

Treatment of parturient paresis with oxygen, Knüsel (*Schweiz. Arch. Tierh., 44 (1902), No. 6, pp. 261–267*).—In his veterinary practice the author had frequent occasion to treat cases of this disease. The treatment adopted at first was the injection of potassium iodid. Under the most favorable circumstances, however, about 40 per cent of the cases died after receiving this treatment. Better results were obtained from the use of air pumped into the udder under considerable pressure. Forty cases were treated in this way with complete success in every case. In explanation of the etiology of the disease the author suggests the possibility of ascribing the disease to the action of a toxin formed by some micro-organism. It might then appear that the free use of atmospheric air was unfavorable to the development of these organisms, which are assumed to be anaerobic.

Contagious mammitis of milch cows, E. Thierry (*Jour. Agr. Prat., n. ser., 5 (1903), No. 10, p. 318*).—Notes are given on an outbreak of this disease in a dairy herd. The symptoms and etiology of the disease are described and a short account is presented of preventive and curative treatment. The curative treatment recommended consists in intramammary injections of a tepid solution of boric acid in water.

A peculiar disease of cattle, M. Strebel (*Schweiz. Arch. Tierh., 44 (1902), Nos. 5, pp. 231–238; 6, p. 293*).—The author describes the symptoms which were observed in a number of outbreaks of disease among cows. The secretion of milk was greatly diminished, the movements and general behavior of the animal were nearly normal and the appetite was only slightly diminished. In one outbreak of the disease a number of animals were affected and some of them were submitted to emergency slaughter on account of their evidently impending death. It was discovered upon investigating these cases that the affected cows had been fed upon clover which was

grown on land treated with some artificial fertilizer, and the author suggests the possible connection between the fertilizer and the disease observed in the cows.

The discovery of the parasite of Texas fever and of carceag, V. BABES (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 6, Orig., pp. 449–458, figs. 4*).—A controversial article in which the author presents evidence for his priority in the discovery of the organism of Texas fever and of carceag or ictero-hematuria of sheep.

The cattle tick situation, H. A. MORGAN (*Proc. Soc. Prom. Agr. Sci. 1903, pp. 72–74*).—Notes are given on the life history of the cattle tick. The author suggests that if infested cattle be removed from their pastures and kept in feed lots or small pastures for a period of about 18 days the majority of the ticks would fall off and the cattle could then be taken back to other pastures which had been freed from ticks by rotation. The author believes that if some such plan were adopted in a cooperative way the cattle-tick nuisance could be readily eradicated.

The duration of active immunity to cattle plague, V. K. TVARYANOVICH (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 1, pp. 25–27*).—In the experiments briefly reported by the author immunity to cattle plague in the calves, cows, and bulls upon which the author experimented was found to persist for a period varying from 4 to 6 months.

Petechial fever in cattle, A. MINDER (*Schweiz. Arch. Tierh., 44 (1902), No. 6, pp. 271–275*).—Detailed notes on the clinical symptoms and pathology of 3 cases of this disease.

Necrosis as a result of Bacillus necrophorus, H. A. VERMEULEN (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 3, pp. 102–111*).—The author investigated a number of cases of necrosis of the liver, in cattle and from material obtained from these cases inoculation experiments were made with laboratory animals to determine the effect of *B. necrophorus*. It was found that the necrosis which is due to this organism may spread by means of embolism, by continuity, or contiguity.

Combating dysentery of calves with collargol, P. STAMPEL (*Ztschr. Thiermed., 6 (1902), No. 4, pp. 284–288*).—On the basis of the author's experiments with this disease it is concluded that dysentery of calves may be in the majority of cases prevented by repeated injections of collargol into the jugular vein during the first 3 days of the calf's life.

Infections of calves due to coli bacilli, BAER (*Schweiz. Arch. Tierh., 44 (1902), No. 5, pp. 223–228*).—Attention is called to the agency of coli bacilli in producing total cataract and icterus in calves. The number of infections produced by organisms of this group is known to be quite large and the diseases are of a variety of forms. Notes are given on the history of cases of total cataract and icterus produced by these organisms. It was found that in cases of total cataract organisms were isolated from the liver, kidneys, and viterous humor.

The beef measle worm in southern parts of Austria-Hungary, F. MUNIH (*Ztschr. Fleisch- u. Milchhyg., 13 (1902), No. 1, pp. 11–13*).—Brief notes on the extent of infestation by this worm, especially in the cities of Trieste, Fiume, and Pola. While the number of cattle found to be infested with this parasite is very small it is believed that figures obtained from the present examination do not represent the actual condition, since the masticatory muscles have not been thoroughly examined.

Experimental study of sheep pox, A. BORREL (*Ann. Inst. Pasteur, 17 (1903), No. 2, pp. 123–137, figs. 13*).—Investigations undertaken by the author were confined largely to filtration of the virus, vaccination, and serotherapy. It was found that when filtration was performed rapidly the virus did not pass through the filter. Notes are given on the most suitable means for obtaining virus in large quantities. In experiments to test the value of serotherapy in this disease the results obtained were quite encouraging. It was demonstrated that 20 cc. of serum obtained from a hyper-immunized animal was more than sufficient to prevent a serious mortality in a badly infested herd. Further experiments will be made to determine the minimum dose of serum required for effective prevention of the disease.

Sheep scab (*Bd. Agr.* [*London*], *Leaflet 61, pp. 6, figs. 3*).—A brief account of the symptoms, cause, and treatment of sheep scab. Notes are given on the life history of the scab mite and on certain preventive measures.

Sheep yards and dips (*Agr. Jour. Cape Good Hope, 22* (*1903*), *No. 2, pp. 157–159, pl. 1*).—Brief notes on a convenient arrangement and construction of sheep yards and dipping vats for use in treatment of sheep scab.

A preliminary report on the fringed tapeworm of sheep (Thysanosoma fimbriata), E. L. MOORE (*South Dakota Sta. Bul. 78, pp. 8, fig. 1*).—This worm is said to be generally distributed throughout the State. It was first observed in sheep upon the college farm. The largest number found in a single animal was 75, and the greatest mortality recorded in a given flock 25 per cent. Brief notes are given on the symptoms of the disease caused by infestation with this worm. The sheep appear to be unthrifty and gradually lose flesh; soft swellings appear under the throat. In preventing infestation with this worm it is recommended that a system of rotation of pastures be adopted and that water should be supplied in tanks raised above the ground so that it can not become contaminated. In treating the disease the best results were obtained from the use of Hutcheson's method with copper sulphate. Detailed directions are given for administering this remedy.

Maggots in sheep, G. T. BROWN (*Jour. Roy. Agr. Soc. England, 63* (*1902*), *pp. 416–420*).—Brief notes on the habits and life history of this insect. In order to prevent its attacks the author recommends the use of fine nettings on the windows of sheep houses and spraying sheep with some fluid possessing an objectionable odor.

The new method of treatment and prophylaxis of swine erysipelas, A. GRÉGOIRE (*L'Ing. Agr. Gembloux, 13* (*1903*), *No. 6, pp. 255–259*).—A brief account is given of the advantages and disadvantages of the Pasteur method of treatment in outbreaks of this disease. The chief disadvantage of this method in the author's opinion consists in the fact that it is merely preventive and has no curative effect. The recent method devised by Leclainche, who succeeded in producing a serum with both preventive and curative properties, is considered of much greater importance in veterinary practice.

The time required for the penetration of the bacilli of swine erysipelas and fowl cholera into the internal organs of mice after a hypodermic inoculation, T. TIEDE (*Ztschr. Thiermed., 7* (*1903*), *No. 1, pp. 41–67*).—The author critically reviews the work of other investigators who have attempted to determine this point with regard to anthrax, glanders, sheep pox, malignant edema, and other diseases. During the author's experiments it was found that in mice the organism of swine erysipelas could be found sparingly in the spleen and liver 15 hours after hypodermic injection; sparingly in the liver and lungs and quite abundantly in the spleen within 24 hours; and in large quantities in all organs within 48 hours. The bacillus of fowl cholera was found in mice after hypodermic inoculation within 15 minutes in the spleen, liver, lungs, and heart, and within 45 minutes in all organs, while after 1 to 3 hours the organisms were less abundant and of less uniform distribution; after 4 hours they were again found in large numbers, from which time until the death of the animal the numbers gradually increased.

Statistical notes on sarcosporidia, A. M. BERGMANN (*Ztschr. Thiermed., 6* (*1902*), *No. 5–6, pp. 462–468*).—During the performance of trichina inspection the author examined the carcasses of 27,751 hogs from the southern part of Sweden, with the result that 30.62 per cent were found infested with sarcosporidia, while in the northern parts of Sweden 27.59 per cent were found infested among 46,610 hogs. The sarcosporidia were distributed quite unequally, certain muscles being most extensively infested. The chief seat of the sarcosporidia was the lumbar portion of the diaphragm.

Diagnosis of glanders, C. TROESTER (*Ztschr. Veterinärk., 14 (1902), No. 8-9, pp. 372-374*).—In the author's experience the inoculation of male guinea pigs with material suspected of being glanderous does not furnish a sufficiently rapid and certain means for diagnosing glanders. The results are often uncertain on account of the frequent death of guinea pigs from septicemia and intermittent diseases. Whenever the results are unsatisfactory it becomes necessary to repeat the cultures of the suspected material, and much time is thus lost.

Serum inoculation against pneumonia in horses and its value from a practical standpoint, WALTHER (*Ztschr. Veterinärk., 14 (1902), No. 11, pp. 500-507*).—The author concludes from his own experiments and those of others that the best method of suppressing outbreaks of pneumonia among army horses is to subject all the horses of the squadron to serum inoculation. When carefully performed, this operation is usually successful and does not entail the loss of much time.

Contagious coryza of horses of the remount station, BECHER (*Ztschr. Veterinärk., 15 (1903), No. 1, pp. 11-13*).—Despite the best care and treatment which could be given to horses suffering from this disease, it was found that a large proportion of the patients suffered from a complication of chronic gastro-enteric catarrh after recovery from the symptoms of contagious coryza.

Fibro-epithelial neomorphs of the skin, liver, and lungs in horses, TETZNER (*Ztschr. Veterinärk., 14 (1902), No. 7, pp. 296-310, pls. 2*).—The present article is occupied with an account of the fibro-epithelial neomorphs in the lungs. The etiology and microscopic anatomy of these structures are described in detail.

The action of the poisonous principle of Equisetum, LUDEWIG (*Ztschr. Veterinärk., 14 (1902), Nos. 10, pp. 447-461; 11, pp. 483-493*).—During the author's numerous experiments with these plants it was found that *Equisetum limosum* was very dangerous to horses, while cattle and sheep could eat it without harm. The converse was true for *E. palustre*. It is believed that the contradictory results obtained in the investigation of these plants by various authors are to be explained by the assumption of a confusion of species. A chemical investigation showed the presence of an alkaloid in both species. Aconitic acid was also found in varying quantities. This substance occurred partly in insoluble combination with lime and partly in an easily soluble form of an alkaline salt.

Poisoning by Equisetum, WÜNSCH (*Ztschr. Veterinärk., 14 (1902), No. 10, pp. 461-467*).—Notes are given on a number of cases of poisoning from this plant which were observed among horses. Some of the horses were affected but slightly, while others died. The various lines of treatment, such as administration of calomel, arecolin, eserin, spirits of camphor, iodid of potash, strychnin, etc., were without apparent effect.

Sorghum poisoning, W. MAXWELL (*Queensland Agr. Jour., 12 (1903), No. 3, pp. 172, 173*).—A brief preliminary report upon investigations which are being conducted with various crops to determine the presence or nonpresence of certain poisonous bodies. As far as the work has been prosecuted it appears not to be safe to give cattle free access to sorghum until the seeds begin to develop. The younger stages appear to be more poisonous.

Some conditions of stock poisoning in Idaho, H. B. SLADE (*Idaho Sta. Bul. 37, pp. 157-190, pls. 2, figs. 3*).—A general discussion is presented on the nature of poisonous plants and the conditions under which poisoning occurs. The statements are largely based on European and American literature on this subject. From the replies to a circular letter distributed to stockmen it is estimated that the stock poisoned by plants during the past year in Idaho aggregated a value of $50,000. Most of the sheep lost in the State were poisoned by lupines. The author discusses the popular and scientific remedies which have been used or can be recommended in preventing fatal effects of plant poisoning. As a general remedy a mixture of potassium

permanganate and aluminum sulphate is recommended. Special notes are given on wild parsnip, death camas, species of larkspur, lupines, and *Veratrum californicum*.

Results of treating tetanus by inoculation with cerebral emulsion, J. Fiebiger (*Ztschr. Thiermed., 6 (1902), No. 3, pp. 161–170*).—The author found that the rate of mortality from tetanus could be much reduced by treatment with cerebral emulsion. The results of this treatment appeared to be quite as satisfactory as those of other known treatments. A treatment with cerebral emulsion is cheaper than serum therapy and the material is more easily obtained. The technique is not too complicated for the ordinary practicing veterinarian.

Fixation of tetanus toxin by the brain, Besredka (*Ann. Inst. Pasteur, 17 (1903), No. 2, pp. 138–147*).—The literature of this subject is critically discussed. The author made an emulsion of the brains of guinea pigs, in testing the effect of the brain upon the tetanus toxin. During these experiments it was shown that the cerebral substance is capable of fixing more tetanus toxin than it can neutralize. The fixative substance of the brain is, therefore, not the same as the antitoxic substance. The cerebral mass, when saturated with tetanus toxin, completely recovers its primitive integrity, after the addition of true antitoxin, whether obtained from an animal of the same or a different species. The combination of the brain substance and the toxin does not give a substance as stable as that obtained by a mixture of toxin and true antitoxin.

The power of the brain to neutralize tetanus toxin, E. Marx (*Ztschr. Hyg. u. Infectionskrank., 40 (1902), No. 2, pp. 231–238*).—A brain emulsion was prepared from guinea pigs and experiments were tried in testing the action of this emulsion upon tetanus virus in vitro. The results of these experiments may be stated as follows: The effect of the brain of guinea pigs is united with that of the antitoxin in neutralizing the tetanus toxin in vitro. It is believed, therefore, that the effects of the brain substance and of the antitoxin are functionally of about equal value.

Antitetanic properties of the central nervous system of immunized animals, K. Dmitrievski (*Ann. Inst. Pasteur, 17 (1903), No. 2, pp. 148–160*).—The author's experiments were made with the brains of immunized guinea pigs. Strict antiseptic conditions were observed in preparing emulsions of the cerebral hemispheres, the base of the brain, and the medulla oblongata, without separation of the latter from the upper portion of the spinal cord. Tetanus toxin was mixed with cerebral emulsions thus obtained from the guinea pigs which had received a single injection of tetanus toxin, those which had been immunized for 1 or 2 months, and others which possessed an immunity of 3 or 4 months' duration. The author concludes from his experiments that the brain of animals which have enjoyed an immunity of short duration, as well as their blood, does not possess any great antitetanic property and does not differ in this respect from the normal brain. The brain and the blood of animals which have been immunized for a long time contains a large quantity of antitoxin and is capable of neutralizing a larger quantity of tetanus toxin than the brain of normal animals. The difference, however, is not very great since all animals which were injected with a mixture of toxin and brain substance from immunized guinea pigs presented certain symptoms of tetanus. The blood of animals which have enjoyed a long immunity always contains more antitoxin than the brain.

The symptoms and prophylaxis of experimental rabies, D. Conradi (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 5, Orig., pp. 389–392*).—The purpose of the experiment reported in this paper was to determine the length of the incubation period of rabies under experimental conditions when the inoculation was made as nearly as possible in a natural manner. The virus was rubbed into abrasions of the skin, which were purposely made, so slight that no bleeding took place. The abrasions thus made and inoculated were washed with solutions of corrosive sublimate after the lapse of from 1 to 10 minutes. During the author's experiments 10 rabbits were treated in this manner, while 3 others were inoculated in the same manner

without treatment of the abraded surfaces with corrosive sublimate. The 3 control animals developed rabies after 174, 177, and 289 days, respectively, and all died, the course of the disease occupying 12, 40, and 24 days, respectively. None of the other 10 animals developed symptoms of rabies during the period of observation, which amounted to 582 days. The author believes that these experiments indicate the possibility of a longer incubation period for rabies than has usually been estimated.

Behavior of rabies virus in the central nervous system of susceptible, naturally immune, and immunized animals, R. Kraus et al. (*Ztschr. Hyg. u. Infectionskrank., 41 (1902), No. 3, pp. 486–526*).—The extensive experiments of these authors were undertaken for the purpose of obtaining information on the question whether rabies virus is propagated throughout the organism by way of the nervous system. The experiments were made on rabbits, pigeons, and hens. It was found that the different portions of the central nervous system, after a subdural infection with the virus of rabies, become infectious at different periods of time. The medulla was found to be infectious after 3 or 4 days when injection was made with laboratory virus, while from 6 to 10 days were required for the same process to take place after injection with virus from rabid animals just dead of the disease. The differences in the rapidity with which the 2 kinds of virus propagate themselves along the central nervous system is believed to be due to the difference in the active powers of multiplication of the different viruses in the nervous tissue. Further experiments of the authors indicate that the virus is not propagated in the dead brain of susceptible animals, but only in the brain of living animals. The authors believe that they have demonstrated that rabies virus is capable of propagating itself and that the negative results from transmission experiments with rabbits are due to the attenuation of the virus. Experiments with immunized rabbits showed that these animals are capable of resisting infection and that the virus of rabies is destroyed in the central nervous system. Immunity toward the disease is therefore believed to reside in the central nervous system, but the actual mechanism of this immunity is not understood.

The formation of substances immune toward rabies virus in naturally susceptible and insusceptible animals, R. Kraus and R. Maresch (*Ztschr. Hyg. u. Infectionskrank., 41 (1902), No. 3, pp. 527–539*).—The results of the authors' experiments may be briefly summarized as follows: Susceptible rabbits and dogs do not normally possess any substance antagonistic to rabies in their serum. Such substances are developed, however, in these animals after immunization with laboratory virus. In susceptible pigeons, only those which have been treated with laboratory virus develop any immune substance in the blood. Chickens, which are only slightly susceptible to rabies, normally have substances antagonistic to rabies in the serum, but do not produce any more of these antagonistic bodies after immunization with laboratory virus.

A bacillus found in animals and resembling that of influenza, A. Wolff (*Centbl. Bakt. u. Par., 1 Abt., 33 (1903), No. 6, Orig., pp. 407–411, fig. 1*).—In experiments undertaken for the purpose of securing a cholera toxin the author discovered an organism in rats which proved to be slightly pathogenic for these animals. The organism closely resembles the bacillus of influenza, and descriptive notes are given on its morphology and biology. The organism is only slightly pathogenic for rats, guinea pigs, and other experimental animals, as shown by inoculation experiments.

A new bacillus belonging to the influenza group, E. Freidberger (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 6, Orig., pp. 401–406, figs. 2*).—The author isolated from dogs an organism which he names *Bacillus hæmoglobinophilus canis* and which showed a striking resemblance to the bacillus of influenza. Notes are given on the behavior of this organism on various culture media. It proved to be slightly pathogenic for guinea pigs and other experimental animals.

Morphological characters and cultures of Bacterium pestis and the relationship of this organism to B. pseudotuberculosis rodentium, B. GALLI-VALERIO (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 5, Orig., pp. 321–330, pls. 2*).—A comparison was made between the morphological characters of these 2 organisms and their behavior upon various nutrient media. The organisms were compared also by means of inoculations of guinea pigs and other rodents. It was found that *B. pseudotuberculosis rodentium* was not pathogenic for rats but was pathogenic for guinea pigs, while *B. pestis* was pathogenic for rats and guinea pigs but did not produce tubercles so frequently as did the other organism.

The influence of passing plague bacilli through animals upon the virulence of these bacilli for different species of animals, R. OTTO (*Ztschr. Hyg. u. Infectionskrank., 41 (1902), No. 3, pp. 380–409*).—During the experiments recorded in this paper plague bacilli were inoculated into rabbits, guinea pigs, rats, and mice, for the purpose of determining the influence of these animals upon the virulence of the bacilli. It was found as a result of these experiments that plague bacilli could be subjected to repeated passages without causing any diminution of virulence for the species of animal in question. It appeared to be impossible to produce any permanent increase in the virulence of the bacilli by passage through animals, but in the case of rats a tendency was manifested toward localization in the lymphatic glands accompanied with an increase in the toxicity of the organism. No alteration in regard to the virulence of the bacilli for different species of animals was observed after subjecting the organisms to repeated passages through one species.

Short notes on a new chicken disease, H. STREIT (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 95–97, figs. 2*).—An apparently infectious disease broke out at Preston, Ont., and caused a great loss among chickens. The clinical symptoms are progressive anemia, sleepiness, paleness of the mucous membranes, and profuse diarrhea toward the termination of the disease, which results in death after from 2 weeks to 2 or more months. In some cases the bones were softened as in rickets, the spleen was usually enlarged to some extent, and the liver greatly enlarged. The liver also exhibited gray nodules, from which rod-like structures were isolated. From the blood of the liver numerous motile protozoa were obtained, and experiments were made to determine whether the disease could be directly transmitted by inoculation with these organisms. Diseased fowls were kept with healthy ones for several weeks without definite results; healthy fowls were fed with diseased organs, also without positive results. Quinin administered in doses of 2 to 6 gr. twice a day appeared to have no influence upon the progress of the disease. This disease is believed to be distinct from the entero-hepatitis in turkeys, as described by T. Smith.

Liver disease in poultry (*Bd. Agr. [London], Leaflet 78, pp. 4*).—Notes on the external symptoms, pathological anatomy, cause, prevention, and treatment of this disease.

The identity of human and avian diphtheria, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 98–104*).—The author discusses the literature of this subject, with a bibliography of 48 titles. During the author's investigations 300 fowls have been under observation or have been inoculated. A number of fowls were inoculated with fresh serum obtained from vaccine manufacturers, and other birds were treated with fresh horse serum. These experiments showed that diphtheria antitoxin produced no effect when inoculated in chickens suffering from fowl diphtheria. Some positive results were to have been expected if the bacteria of human and avian diphtheria were the same. Ordinary horse serum gave better results than antidiphtheritic serum but was not a specific for fowl diphtheria. Inoculation experiments indicated that the bacillus of human diphtheria was not pathogenic for hens. Cultures were obtained from over 200 fowls which had died of fowl diphtheria or were killed in some stage of the disease, and no trace of bacilli

of human diphtheria was found in any of them. Roup, or fowl diphtheria, according to the author, is produced by *Bacillus cacosmus*. It was also found that roup with its various symptoms could be produced by inoculation with *B. pyocyaneus*.

AGRICULTURAL ENGINEERING.

Report of irrigation investigations in Utah (*U. S. Dept. Agr., Office of Experiment Stations, Bul. 124, pp. 316, pls. 19, figs. 2*).—This is a report of investigations made during 1901 and 1902 under the direction of Elwood Mead, chief of irrigation investigations of this Office, assisted by R. P. Teele, A. P. Stover, A. F. Doremus, J. D. Stannard, Frank Adams, and G. L. Swendsen. The report contains the following papers: General Discussion of Irrigation in Utah and Irrigation from Jordan River, by R. P. Teele; Irrigation in Utah Lake Drainage System, by A. P. Stover; The Spanish Fork River Irrigation System, by A. F. Doremus; Irrigation in the Weber Valley, by J. D. Stannard; Agriculture Under Irrigation in the Basin of Virgin River and Court Adjudications of Water Rights on Sevier River, by Frank Adams; and Appropriation of Water from Logan River, by G. L. Swendsen.

The bulletin is the second of a series of reports on irrigation laws and institutions of individual arid States, the first being devoted to California conditions (E. S. R., 13, p. 794). It also deals with the methods and results of irrigation, duty of water, crop values, cost of water, and improvement of methods and practices.

The plan followed in the investigations reported was to select typical streams in various parts of the State, and describe the actual conditions created by the appropriation and use of their waters. Thus, the Virgin and Sevier rivers were selected in the southern part of the State, the Weber and Logan in the northern part, and the Jordan and its tributaries in Central Utah. In this way practically every feature of the State's irrigation system is described.

The distinctive features of the Utah irrigation system, as brought out in this report, are cooperation in the organization and operation of canals and the time method of distributing water to users. The principal weakness of the system is that rights are not defined until they come into controversy. In 1903 the State legislature enacted a law which was drawn for the purpose of defining all existing rights, and of providing for the control of the acquirement of rights in the future, thus making all rights a matter of record, giving those charged with the distribution of water a definite basis for its division, and giving notice of the extent of existing rights to those desiring to obtain rights to divert water.

The duty of water as measured under 11 canals varied from 8.15 to 106 acres per cubic foot per second of water. The value of crops, as recorded for 20 localities, varied from \$10.93 to \$39.40 per acre. The annual cost of water per acre as recorded for 25 canals and ditches varied from 40 cents to \$3.

The utilization of Utah Lake as a reservoir, W. P. HARDESTY (*Engineer. News, 49 (1903), No. 21, pp. 442–445, figs. 5*).—A description of the dams regulating the outflow of Utah Lake and of the pumping plant raising the water of the lake into the Jordan River and thus maintaining the flow in the latter in seasons of low water.

Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, I. C. RUSSELL (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 78, pp. 53, pls. 2, figs. 3*).—This report is based on investigations made in 1901 and 1902, "and contains a description of the geologic structure of southwestern Idaho and southeastern Oregon, with special reference to the occurrence of underground waters. The artesian basins are described as far as these are known, and facts are assembled as to the probabilities of obtaining deep or flowing wells." The four principal areas in southwest Idaho and southeast Oregon in which artesian water has already been discovered, or in which convincing evidence is found that it

may be obtained, are described. These are the Lewis basin, on the Snake River, between Glenns Ferry and Weiser; the Otis basin, in the extreme northeastern part of Harney County, Oreg.; the Harney basin, included in the inland basin draining into Malheur and Harney lakes, and the Whitehorse basin, in the southern part of Whitehorse Valley.

The legal restrictions which should control the construction and use of artesian wells are pointed out and the text of the Washington law relating to this subject is given.

Duty of water in Montana, S. FORTIER (*Montana Sta. Bul. 43, pp. 55, figs. 56*).—This is the second of a series of farmers' bulletins on irrigation and includes a summary of results of studies made in cooperation with the irrigation investigations of this Office. The bulletin defines "duty of water," discusses methods of measuring duty of water, and conditions affecting it, viz, losses in conveyance, climatic conditions, system of fixing time rotation, manner of paying for water, judicial decrees for excessive amounts, cultivation and grading, kind of crops, manner of irrigating, character of soil and subsoil, ground-water level, and configuration of the surface of the land; and gives tabular statements accompanied by diagrams showing the observed duty of water under laterals in 46 different cases and under canals in 8 different cases. The average duty under laterals was 142 acres for each cubic foot-second of water, or 3.7 acres per miner's inch. The duty under canals was considerably less, about 2.5 acres, due to losses in conveyance.

Water resources of Molokai, Hawaiian Islands, W. LINDGREN (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 77, pp. 62, pls. 4*).—This report is based on observations made in 1900 and deals with the water supply in its relation to the decrease of the forested area, grazing, and other conditions. The problems of water conservation and utilization are discussed and it is shown that they are "rather difficult and involved, but are similar in many respects to those of the arid West, the solution being found in combined systems of storage, water-power development, use of the power in pumping, the construction of wells, collecting tunnels, and the economical employment of various devices for lifting water." The topography, geology, soils, climate, vegetation, agricultural possibilities, etc., of the island are also briefly discussed.

"The soils of Molokai are similar to those of the other islands of the Hawaiian group and are usually of great fertility. They may be divided into residual and sedimentary soils.

"The residual soils result from the gradual decomposition of the basaltic lavas and are usually deep red, very rich in iron and in substances necessary for plant growth.

"The sedimentary soils are partly of a deep-red color, partly dark brown, and not very different in character from the residual soils; they consist, in fact, of the same substance merely transported and redeposited. In a few places along the immediate coast line are small areas covered by coral sand, consisting largely of carbonate of lime, usually more or less mixed with detritus from the hills.

"The west end of the island contains a very great amount of good, smooth land, with excellent soil. . . .

"The finest body of agricultural land on the island is situated in the great gap, and has an area of about 14,000 acres. The principal problem of the water supply of the island is how to bring the water from that part which receives an abundant precipitation to this arid portion containing the rich soils."

The rainfall on the northeasterly portion of the island and at all points over 2,500 ft. high is abundant, reaching 100 ins.; the west end and south coast are dry.

The sources of water supply which are discussed include springs, running streams, and wells. Estimates of the total amount of water available are given.

Preliminary plans and estimates for drainage of Fresno district, California, C. G. Elliott (*U. S. Dept. Agr., Office of Experiment Stations Circ. 50, pp. 9*).

Practical irrigation in humid areas, B. Adams (*Forestry and Irrig., 9 (1903), Nos. 6, pp. 285–288, figs. 3; 7, pp. 346–353, figs. 4*).—This article gives somewhat detailed descriptions of various irrigation plants used in Massachusetts, New Jersey, Florida, Texas, Kansas, and Wisconsin.

The management of water in Java, F. Bernard (*Aménagement des eaux à Java. Paris: Librairie Polytechnique, 1903, pp. 80, pls. 16, figs. 75*).—A study of the Javan system with reference to applicability to Indo-China. Since the Javanese so largely subsist on rice the report is substantially a treatise on rice irrigation. In the first part the development of agricultural industries since 1602 is briefly traced and the topography and other features of different parts of Java, the drainage basins, dams, canals, ditches, etc., are described. Maps show the irrigation system in detail and the nature and extent of the area irrigated. The second part deals with technical hydraulic and engineering details of construction and management of dams of various kinds, canals, aqueducts, siphons, weirs, etc. The third part is devoted to the actual distribution of water in rice culture.

Government control is briefly discussed. The water is distributed gratuitously, the government being reimbursed by the tax on the crop. When works now in progress are completed the government will be able to irrigate 775,000 hectares (1,914,250 acres) of land. This has been done at an expense of 300 to 400 francs per hectare ($24 to $32 per acre).

The restoration of the ancient irrigation works on the Tigris or the recreation of Chaldea, W. Willcocks (*Cairo: National Printing Dept., 1903, pp. 71, pls. 10*).—The author describes these works, especially the Nahrwan Canal, and discusses their restoration. Appendixes give monthly summaries of observations on temperature, pressure, rainfall, and wind movement at Bagdad during 1888, 1894, 1899–1902, and an address on Egypt 50 years hence.

The new directorate of agricultural hydraulics and improvement, L. Mougeot (*Jour. Agr. Prat., n. ser., 5 (1903), No. 6, pp. 183–187*).—The report, decrees, and regulations regarding the establishment of this directorate are given in full.

Notes on the floods of February 28 to March 5, 1902; effect of proposed drainage works on Passaic floods, C. C. Vermeule (*Geol. Survey New Jersey Rpt. 1902, pp. 27–57, pls. 7*).—A study of the causes and conditions of these floods, with a discussion of means of controlling such floods by means of storage reservoirs, drainage, etc.

First annual report of the State board of public roads of Rhode Island (*Providence, R. I.: E. L. Freeman & Sons, 1903, pp. 32, map 1*).—This is the first report of the board appointed under authority of an act of the State legislature passed in January, 1902, and deals with present conditions, needs, etc., of Rhode Island highways, and presents a classification of the "main or principal highways of the State" with recommendations of the sections to be first constructed. "The length of these particular sections makes a total of 20 miles, and the estimated cost for the proper improvement of the same amounts to $100,000, an average of $5,000 per mile. The estimate in each case provides for the construction of a macadam road of a standard width of 14 ft., exclusive of shoulders and gutters, with a varying thickness of crushed stone from 6 to 9 in., according to the location of the road, the nature of the soil, the amount and weight of traffic, and includes drainage and grading. . . . For the present year the board recommends an appropriation of $100,000, to be followed by an annual increased appropriation of $25,000 for 3 years; and for the fifth and sixth year an appropriation equal to that made for the fourth year. By this plan of graded appropriations the whole work could be completed within a period of 6 years."

On the cause of the cementing value of rock powders and the plasticity of clays, A. S. Cushman (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 451–468, figs. 3*).—A series of comparative studies are reported which lead to the conclusions "(1) that the cementing power of rock powders is a property similar to the plasticity of clays; (2) that all rock powders that have cementing power show the same peculiar relation to water that is shown by substances that possess an amorphous colloid structure, i. e., they can be dehydrated and rehydrated, until, by prolonged high heating, the structure is destroyed." Page's method of testing the cementing value of rock powders, which was used in the experiments reported, is in brief as follows: "The stone or other material is ground in a ball mill until it passes a screen with 40 meshes per centimeter (100 per inch). This sifted powder is then mixed with sufficient water to make a stiff 'dough.' After standing 24 hours, cylindrical briquettes are made of standard size (25 mm. by 25 mm.) at a standard pressure of 100 kg. per square centimeter. This is done in a specially designed hydraulic press. The briquettes are then dried in an air bath at 100° and tested in an impact machine which delivers a standard blow of 1 kg., falling 1 cm. The cementing value is measured in this laboratory by the average number of standard blows that a series of briquettes made from a rock powder will stand."

Machines at the general agricultural congress at Paris, M. Ringelmann (*Jour. Agr. Prat., n. ser., 5 (1903), Nos. 13, pp. 404–411, figs. 14; 14, pp. 437–440, figs. 8; 15, pp. 470–475, figs. 12*).—This includes a general account of the exhibit of agricultural machinery at this congress, and describes special forms of machines of the following classes: Machinery and implements for (1) preparing the soil, (2) for seeding and subsequent culture, (3) for harvesting the crop, (4) for preparing the crops for use, and (5) for miscellaneous purposes.

Fertilizer machinery (*Amer. Fert., 18 (1903), No. 6, pp. 5–19, figs. 19*).—Various machines used in the preparation of fertilizers on a commercial scale are described.

Tests of machines for the decortication of rice in Madagascar, M. Ringelmann (*Agr. Prat. Pays Chauds, 2 (1903), No. 12, pp. 697–702, figs. 3*).—Tests of 4 machines for this purpose are reported.

Cold-storage building, J. B. Reynolds (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 6–9, figs. 6*).—An account is given of the construction of a cold-storage building using mechanical refrigeration, with a summary of results of experiments with it, which have been reported elsewhere. (E. S. R., 14, p. 866.)

Cooperative granaries and structures for drying grain, M. Ringelmann (*Jour. Agr. Prat., 3. ser., 5 (1903), No. 19, pp. 600–603*).—Previous articles on this and related subjects are noted and a number of structures in actual use are described.

Notes on stable ventilation, Noack (*Deut. Landw. Presse, 30 (1903), No. 34, p. 289*).—Brief remarks on the importance of adequate ventilation even for piggeries, and on means of securing it.

Whitewash and lime paints for farm buildings, M. Ringelmann (*Jour. Agr. Prat., n. ser., 5 (1903), No. 16, pp. 501, 502*).—Various formulas are given.

MISCELLANEOUS.

Fifteenth Annual Report of Louisiana Stations, 1902 (*Louisiana Stas. Rpt. 1902, pp. 24*).—This contains a summary of the work of the Sugar Station at Audubon Park, the State Station at Baton Rouge, and the North Louisiana Station at Calhoun, an outline of the work of the State geological survey, a list of publications issued by the stations, organization lists, and a financial statement for the fiscal year ended June 30, 1902. Results in 1901 and 1902 of comparative tests of sugar-cane seedlings are brifly reported.

Eighteenth Annual Report of Maine Station, 1902 (*Maine Sta. Rpt. 1902, pp. 226*).—This is made of reprints of Bulletins 79–88 of the station on the following

subjects: Poultry experiments in 1900-1901 (E. S. R., 13, p. 981); feeding stuff inspection (E. S. R., 13, p. 1075); fertilizer inspection (E. S. R., 13, p. 1031); orchard notes (E. S. R., 14, p. 42); grass thrips (E. S. R., 14, p. 373); cereal breakfast foods (E. S. R., 14, p. 376); fertilizer inspection (E. S. R., 14, p. 649); variations in *Trillium grandiflorum* (E. S. R., 14, p. 634); oat smut and its prevention (E. S. R., 14, p. 877); potato insecticides and fungicides in 1902 (E. S. R., 14, p. 886); finances, meteorology, index (noted below).

Fifteenth Annual Report of Michigan Station, 1902 (*Michigan Sta. Rpt. 1902, pp. 67–325*).—This includes a financial statement for the fiscal year ended June 30, 1902, reports of the director and heads of departments on the work of the station during the year, meteorological observations noted elsewhere, and reprints of Bulletins 193–202 and Special Bulletin 16 of the station on the following subjects: Some experiments with beet pulp as a stock food (E. S. R., 14, p. 179), feeding experiments with dairy cows (E. S. R., 14, p. 182), report of the South Haven Substation for 1901 (E. S. R., 14, p. 143), strawberry notes for 1901 (E. S. R., 14, p. 147), notes on vegetables (E. S. R., 14, p. 143), sugar-beet experiments in 1901 (E. S. R., 14, p. 244), sand lucern (E. S. R., 14, p. 243), cowpeas, soy beans, and winter vetch (E. S. R., 14, p. 239), some insects of the year 1901 (E. S. R., 14, p. 267), aeration of milk (E. S. R., 14, pp. 387, 388), and analysis of commercial fertilizers (E. S. R., 14, p. 343).

Fourteenth Annual Report of Texas Station, 1902 (*Texas Sta. Rpt. 1902, pp. 139–146*).—This consists of a report of the director on the work of the station and substations during the year and a financial statement for the fiscal year ended June 30, 1902.

Finances, meteorology, index (*Maine Sta. Bul. 88, pp. 211–226+8*).—This includes reprints of 6 newspaper bulletins dealing with fresh fish as manure, the Angora goat, management of raspberries and blackberries, apples and plums for central Maine, experiments with clover and low grade cotton-seed meal; meteorological observations noted elsewhere, a financial statement for the fiscal year ended June 30, 1902, an index to the bulletins of the station issued during the year, and announcements relative to the work of the station.

Proceedings of the twenty-fourth annual meeting of the Society for the Promotion of Agricultural Science held at Washington, D. C., December 29, 1902 (*Proc. Soc. Prom. Agr. Sci. 1902, pp. 113, pls. 2*).—The papers which were read at the meeting were noted in the article in E. S. R., 14, p. 523. The president's address was given in full in E. S. R., 14, p. 625. The other papers which have been included in the proceedings are noted elsewhere in this issue.

History of the Örebro Royal Agricultural Society from 1803–1902, J. V. JONSSON (*Örebro Läns Kongl. Hushållnings-Sällskaps, historia 1803–1902. Örebro: Örebro Dagblads, 1902, vols. 1, pp. 430, pls. 14; 2, pp. 307, pl. 1*).—In these 2 volumes the author has brought together an elaborate historical account of the development of agricultural industries in the district of Örebro from the earliest historical times until the present. Particular attention, however, is given to the development of agriculture during the nineteenth century. The various subjects which are discussed include an historical review of Swedish agriculture before the year 1800, historical notes on the development of the above society during the nineteenth century, notes on the agricultural school of the district and other related schools, notes on the lakes and marshes of the Örebro region, and general accounts of cattle raising, dairying, horse breeding, forestry, fruit raising, domestic science, and fish culture.

The agricultural development of the Philippines, M. L. TORNOW (*Berlin: Hermann Patel, 1901, pp. 53, figs. 10, map 1*).

Experiment station work, XXII (*U. S. Dept. Agr., Farmers' Bul. 169, pp. 32, figs. 6*).—This number contains articles on the following subjects: Pure water for

cows; when to cut forage crops; lippia or fog fruit; pithiness in celery; irrigation of strawberries; farmers' fruit garden; management of orchards; tropical and subtropical fruits; China asters; preserving sweet potatoes; food value of beans; tankage for pigs, and remedies for fleas.

The farmer's business handbook, I. P. ROBERTS (*New York and London: The Macmillan Company, 1903, pp. XIII+300*).—The object of this book (one of the Rural Science Series) is to encourage the average farmer to adopt more business-like methods. It treats of the simpler forms of farm accounts, and the commoner and more usual aspects of law as applied to rural matters. It also contains agricultural inventories from the Twelfth U. S. Census.

Destruction by lightning in Ontario, 1902, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 9–11*).—Statistics are given of damage to buildings, trees, stock, and persons.

NOTES.

Alabama College and Station.—J. F. Duggar has been elected director of the station. The chemical work of the station has been divided; hereafter Prof. B. B. Ross will have charge of the analysis of fertilizers and feeding stuffs and Dr. J. T. Anderson, now promoted to the position of chemist, will have charge of the analysis of soils and crops. J. C. Phelps, assistant chemist, has resigned to engage in teaching agriculture and chemistry in the district agricultural school at Evergreen, Ala.

Arkansas Station.—W. G. Vincenheller has been elected director to succeed R. L. Bennett, resigned. The substation at Newport has been closed and the property there will be disposed of.

California Station.—The last legislature appropriated $5,000 to the station as a deficiency fund for the publication of delayed bulletins and reports, and $6,000 annually for two years for university printing, a portion of which will be available for publications of the station. Henry J. Quayle of Illinois has been appointed assistant in entomology, and George Roberts, formerly of the Kentucky Station, assistant chemist in charge of the fertilizer control. M. E. Jaffa, who has been on a year's leave of absence, has returned. Professor Jaffa spent a portion of the time with Prof. W. O. Atwater at Middletown, Conn., studying methods of food investigation, and about four months traveling in Europe studying agricultural institutions of various kinds.

Connecticut College and Station.—W. E. Simonds, former vice-president of the board of trustees, is dead.

Delaware College.—W. H. Bishop, professor of agriculture and biology, has resigned to engage in dairy farming and stock breeding at Scarsdale, N. Y. He is succeeded by James A. Foord, formerly of Cornell University and Station.

Georgia Station.—The station is overhauling its waterworks system, putting in a new pump and gasoline engine, and constructing a 20,000-gallon reservoir to be filled with spring water. The pump will be used as a means for irrigating small areas near by.

Hawaii Station.—The legislature of Hawaii has appropriated for the biennial period ending June 30, 1905, $111,650 for the board of agriculture, horticulture, and forestry. This includes $16,800 for the federal experiment station as follows: Maintenance $10,000, salary of chemist $2,000, laboratory and office building $3,000, residence for chemist $1,500, stenographer $600, and farmers' institutes $300.

Indiana Station.—The station cattle barn was struck by lightning and entirely destroyed on July 10, the loss, including contents, being over $4,800, with insurance amounting to $2,500. No stock was lost. The building will be replaced by a temporary structure costing between $1,500 and $2,000, with the intention of erecting next year a more substantial barn at a cost of about $15,000.

Iowa College and Station.—Rev. A. B. Storms of Des Moines has been elected president of the college and will take up his duties with the beginning of the new college year. G. E. Stayner has been appointed assistant in agronomy at the station.

Kansas College and Station.—D. H. Otis, in charge of animal husbandry in the college and station, has resigned to become superintendent of a large farm in Labette County, Kans. He entered upon his new duties about September 1.

Maine University.—The last legislature appropriated $2,500 a year for a department of forestry, and the trustees have now authorized the appointment of a professor of forestry.

Massachusetts Station.—W. E. Tottingham has been appointed assistant in the chemical laboratory, department of foods and feeding.

Michigan College and Station.—Hon. Franklin Wells, for thirty years a member of the State board of agriculture, which has charge of the college and station, and for nearly twenty years president of that board, died suddenly July 3, at Constantine, Mich. He is succeeded by Charles F. Moore, of St. Clair.

Missouri University and Station.—The station has established what is thought to be the first laboratory for animal breeding in the United States. It is intended to investigate some of the applications of Mendel's law to animal breeding, and to observe accurately the results from various methods of breeding. Observations will be made on the factors which determine the birthweight of animals. This laboratory is in charge of Prof. F. B. Mumford. E. B. Forbes, B. S., of the University of Illinois, has been elected assistant professor of animal husbandry.

Nebraska University and Station.—The contracts have been let for a dairy barn and stock-judging pavilion and machine shops, provided for by the last legislature. The cost of these two buildings will be about $20,000. The barn will be 164 ft. long, the main part being 80 ft. wide and the wings 40 ft. and 64 ft., respectively. It will cost about $10,000 when finished. It will contain a stable for cattle, 60 by 64 ft., and accommodate 50 dairy cows and about 20 or 30 young cattle. It will contain a bedroom, bathroom, and closets for farm men; and will also have accommodations for hay and grain storage, with several box stalls for hospital purposes and for stock bulls. A live-stock judging pavilion, 40 by 60 ft., will form one wing to the barn. This, together with the offices, will be heated with steam. The shop building will include a farm-machinery room for instruction in the handling of ordinary farm machinery, a carpenter shop for elementary work, and a blacksmith shop for forge work. The main part of this building is 42 by 72 ft., two stories high, with a wing for the blacksmith shop, 40 by 60 ft., one story high. The contract is also about to be let for the construction of a greenhouse and horticultural laboratory for students' use, the greenhouse space to be 40 by 60 ft. and the horticultural workroom about 40 ft. square, the cost of this building to be about $6,000. A class of 45 teachers from different parts of the State took a course in agriculture at the summer school. The chemical department of the station has been making analyses of samples of sorghum, taken daily during a recent dry spell, to ascertain the relation, if any, between dry weather and the presence of prussic acid, as has been claimed.

Nevada College and Station.—J. E. Stubbs, president and director, is traveling in Japan for his health, which he has not fully recovered since his recent severe illness. N. E. Wilson, chemist, has been appointed vice-director of the station. S. B. Doten, entomologist, has been making quite extensive experiments in the field in destroying locusts and crickets, which are proving a great plague in the eastern counties of the State.

New Hampshire Station.—Lucian A. Hill, assistant chemist, has resigned to become assistant chemist in the research laboratory of the McLean Insane Asylum at Waverly, Mass. H. H. Scudder, formerly of this Department, and W. E. Hayes have been appointed assistant chemists in the station. W. D. Gibbs, of the Texas College and Station, has been elected president of the college and director of the station, and will enter upon his new duties September 1.

New Jersey Station.—The board of managers has awarded the contract for rebuilding the laboratory building, which was partially destroyed by fire in April. It is expected that the building will be ready for occupancy in September.

Cornell University and Station.—I. P. Roberts retired from active duties in the college and station July 1. He is succeeded by L. H. Bailey, who is director of the college of agriculture, dean of the faculty, and professor of rural economy. H. H. Wing, who has heretofore had charge of animal industry and dairying, has been relieved of the latter subject, which is now in charge of R. A. Pearson, formerly assistant in the dairy division of this Department. Samuel Fraser, formerly of the Briarcliff School, has been elected instructor in agronomy, and J. A. Bonsteel, of the Bureau of Soils of this Department, has been elected to the chair of soil investigation. G. W. Cavanaugh has become assistant professor of chemistry in its relations with agriculture, and J. A. Bizzell has been appointed assistant chemist to the experiment stations. John Craig, formerly in charge of extension work, is now professor of horticulture, with R. S. Northup of North Dakota as assistant. The university has recently purchased three farms lying contiguous to the old farms, which will be used in connection with the station and college work in agriculture.

North Carolina College.—The summer school for teachers during the month of July was attended by 361 teachers, about 140 of whom took agriculture and nature study. The school was a great success and aroused much enthusiasm. A farmers' convention covering 3 days was held at the close of the school, which was attended by between 250 and 300 persons. A permanent organization was effected and a much larger meeting is planned for next year.

Ohio Station.—George M. Lummis has been appointed assistant botanist.

Oklahoma College and Station.—Material changes have been made in the courses of study in the college. The preparatory department has been discontinued and in its stead a school of agriculture and domestic economy has been established. The course in the school covers 2 years of 20 weeks each, beginning October 15 and closing March 15 in each year. Students proficient in common school studies may take all of the agricultural work of the school in 1 year of 20 weeks. The college course has been extended to 5 years, and graduates of the common schools are admitted to the subfreshman class without examination. The college course in agriculture has been modified so that in addition to full work in agriculture and allied subjects, the student will elect from botany, veterinary science, and chemistry, 4 terms work in one and 3 terms work in another, in addition to the required work earlier in the course. The 8 weeks short course will be continued. W. C. Theile has been appointed clerk and stenographer of the station, vice C. O. Pearcy, resigned. F. O. Foster, a graduate of the Michigan Agricultural College, has been appointed assistant in agriculture in the station and assistant in dairying in the college.

Rhode Island College and Station.—Ex-Governor Charles Dean Kimball, of Providence, has been appointed on the board of managers, vice Benjamin A. Jackson, term expired, and was elected president of the board at the July meeting. The temporary appointment of W. D. Hurd, B. S., to act as agricultural demonstrator marks a new epoch in Rhode Island. He is paid from a special State appropriation and is giving demonstrations around the State in soil testing, spraying, and other agricultural lines, thus carrying directly to the farmers the results of the investigations of this and other stations. This work seems to meet with general favor.

South Dakota College.—J. W. Heston has resigned from the presidency of the college and has been succeeded by Rev. James Chalmers.

Wisconsin University and Station.—George C. Humphrey, instructor in animal husbandry at the Michigan Agricultural College, succeeds W. L. Carlyle, who, as previously noted, has resigned to accept a similar position in the Colorado College

and Station. W. B. Richards has been appointed assistant in animal husbandry. Dr. A. S. Alexander, lecturer in the Chicago Veterinary College, has been appointed instructor in veterinary science and will also give lectures and demonstrations on the horse. The last legislature appropriated $25,000 for furnishing and equipping the new agricultural building and $15,000 for a farm engineering building. It also gave $10,000 for the purchase of improved live stock, $10,000 for the purchase of additional farm lands, $1,500 annually for 2 years for tobacco investigations, and $2,500 annually for 2 years for cranberry investigations.

Wyoming University and Station.—E. E. Smiley, president of the university, has resigned, the resignation to take effect September 1. Wilbur C. Knight, professor of geology and mining engineering in the university and geologist of the station, died July 28. The State board of charities has turned over to the university and station the penitentiary buildings and farm in Laramie, the last of the prisoners having been transferred to the new penitentiary at Rawlins. The buildings connected with the penitentiary belonging to former contractors were purchased for the station from State funds. There is thus added to the college and station equipment a farm of 320 acres, situated on the Laramie River, where an abundance of good water is at hand, and buildings which cost originally approximately $100,000. The final purchase of the old experiment station farm, consisting of 120 acres, has been authorized. The station is to take up work with live stock, and it is expected that some breeding stock of cattle, horses, and swine will be added during the year. It already has the promise of a few brood mares with which to begin its work in horse breeding.

Convention of Farmers' Institute Workers.—The eighth annual meeting of the American Association of Farmers' Institute Workers was held in the Parliament Buildings, Toronto, Canada, June 23–26. Seventeen of the States of the Union and four of the Provinces of the Dominion of Canada were represented by their institute officials.

The association was welcomed to Canada by the Honorable G. W. Ross, Premier of Ontario, who spoke of the remarkable progress which agriculture had made in recent years, both in the United States and in the Dominion of Canada, and of the friendly competition that exists between the two countries.

The president, W. C. Latta, in his annual address, reviewed the scope and growing importance of the farmers' institute work, dealing particularly with the means of making it more effective for good. Referring to the training of the institute worker he said that this should be special and "should include a boyhood spent on the farm, a common and high school education, a thorough technical training at an agricultural college, and, after graduation, several years of experience in some line of practical agriculture." The qualifications of the workers and the organization of farmers' institutes was discussed at length.

The programme included the following papers, most of which were quite freely discussed: Training for Institute Work; Prime Qualifications; Should the Worker have Special Training? How may it be Secured? Franklin Dye, Trenton, N. J. Organization for Institute Work—Should it be a Permanent Organization or should we work through other Farmers' Organizations? L. R. Taft, Agricultural College, Michigan. Accessories in Institute Work—Demonstrations, Judging Contests, Field Experiments, F. H. Rankin, Urbana, Ill. How far is it Practicable to Conduct a Season's Campaign in some Agricultural Interest? What Interests may be Appropriately and Successfully Advanced, such as Roads, Homes, Reforesting, Agriculture in High Schools, or Agricultural Education? F. E. Dawley, Fayetteville, N. Y. How to Advertise Institute Meetings, Geo. McKerrow, Madison, Wis. The Evening Session—How to make it Interesting and Instructive: (a) The Romance of Agriculture, C. C. James, Toronto, Canada; and (b) Local Help, Wesley Webb, Dover, Del.

Some Essentials to the Permanency of Farmers' Institutes, E. B. Voorhees, New Brunswick, N. J. How the Farmers' Institutes and the Agricultural Colleges may be mutually helped, Dr. James Mills, Guelph, Canada. How the National Department of Agriculture may through its Institute Office Assist the State Institute Meetings, John Hamilton, Washington, D. C. Women's Institutes, Miss Laura Rose, Guelph, Canada, and Miss Agnes Smith, Hamilton, Canada. How the Institutes can Bring the Most Good to Our Girls, Miss Blanche Maddock, Guelph, Canada. How to Enlist the Interest of Our Boys in Agriculture, Hon. John Dryden, Toronto, Canada.

There was a discussion of problems and methods in institute work, participated in by delegates selected from different sections of the country; and the institute work from the standpoint of the worker was discussed by D. C. Anderson, Andrew Elliott, and Henry Glendinning, of Ontario.

The reports of the directors giving account of the institute work in the several States all indicated that progress had been made during the year, and that appreciation of the work is becoming more general as the public becomes better acquainted with what is being done for the benefit of agriculture through this method of instruction, and with what is possible to be accomplished.

Expressions with regard to the quality of the work required showed that the people were not satisfied with anything but the best. The problem now confronting the institute directors is that of securing a sufficient number of capable instructors to meet this need. Two of the State directors reported that they were about to introduce into their system a normal school plan for training lecturers, the instructors in these schools to be selected from the forces of the agricultural college and experiment station, and the school to continue from one to two or three weeks as the necessities in each case seem to justify.

On Thursday the members of the association and their friends were given a complimentary trip to the Ontario Agricultural College at Guelph, where luncheon was served and the visitors were escorted over the grounds and through the buildings by the members of the faculty. The president, Dr. James Mills, in a short address, explained to the association the work and purpose of the college. He called attention to its appreciation on the part of the citizens of Ontario by stating that during the month of June, last year, over 30,000 farmers had visited the college and inspected its work, and that this year that number would probably be exceeded. On the day that the association was at the college there were over 1,200 visiting farmers present. This movement was begun, and has been developed to its present proportions, through the instrumentality of the farmers' institutes of the Province.

At a business meeting on Wednesday several amendments to the constitution, proposed at the last annual meeting, were considered and adopted. Among them was one providing for representation of this Department in the association by two delegates, one from the Department at large and one from the Office of Experiment Stations. Resolutions were passed expressing appreciation of the interest manifested by the Department and the Office in the institute work and in the meetings of the association, and approving the step which has been taken in establishing an agency in the Department for its promotion and aid.

On Friday morning such of the members as remained over were taken around the city in a tallyho coach, and given opportunity to see its principal streets, public buildings, and other objects of interest; after which they were driven to the Dentonia Stock Farm, now owned by Mrs. W. H. Massey, of Toronto. The visitors were shown over the dairy, and the various barns and other buildings connected with this farm, all of which are complete in their appointments, and admirably arranged for their purposes.

St. Louis was selected as the place of the next meeting, the date being left for the executive committee to fix. The officers elected for the ensuing year were: Presi-

dent, B. W. Kilgore, of North Carolina; vice-president, E. E. Kauffman, of North Dakota; secretary-treasurer, G. C. Creelman, of Toronto, Canada; executive committee, Geo. McKerrow, of Wisconsin; H. G. Easterly, of Illinois; and J. C. Hardy, of Mississippi, in addition to the president and the secretary-treasurer, ex officio.

American Chemical Society.—The twenty-eighth general meeting of the American Chemical Society was held at Cleveland, Ohio, June 29 and 30. About 100 members were present. A brief address of welcome was delivered by Prof. E. W. Morley, of Western Reserve University, to which the president of the Society, Dr. J. H. Long of Northwestern University responded. While the programme was of the usual length for the summer meetings, few papers of direct agricultural interest were presented. A paper by G. B. Frankforter, of the University of Nebraska, showing that 42 per cent of pitch, containing 21 per cent of turpentine, besides a large amount of good charcoal, can be obtained from the butts of the Douglass fir which are now discarded by lumbermen, was of especial interest as pointing a way to a better utilization of our forest products. Dr. F. K. Cameron of this Department discussed the toxic limits of various acids and salts, singly and combined, for seedlings of corn, wheat, and clover, showing the acids to be, as a rule, more toxic than the salts and single salts more so than mixtures. The results, however, are not uniform with the different plants and do not always bear out the dissociation theory. The possibility of breeding plants of high resistant power was referred to.

In a paper on cereal foods, by E. Gudeman, it was shown that as a rule these differ very slightly in composition from the grains from which they are prepared. The carbohydrates have probably been rendered somewhat more digestible by the cooking processes through which the cereal foods have gone.

A. A. Noyes and R. B. Arnold discussed the rate and conditions of hydrolysis of starch, and the precautions to be observed in determining this substance by means of Fehling's solution. It was shown that the acid solution should not be completely neutralized before the Fehling's solution is added.

A paper by A. P. Sanders on the analysis of sea water from Woods Hole led to a discussion of the possibility of sympathetically preparing sea water in which marine flora and fauna would thrive. Dr. J. S. Chamberlain of this Department, pointed out that this had been successfully done in some experiments conducted in the Department.

The afternoon of each day was devoted to excursions through the city and to the chief industrial centers and manufacturing plants of Cleveland. The city contains an unusual number of establishments of this sort in which chemistry finds important application.

New Hydrographic Committee in Russia.—The past spring a law was promulgated for the establishment, in the Russian ministry of agriculture and imperial estates, of a hydrographic committee to deal with scientific, technical, and legal questions relating to the conservation and regulation of the water supply of the country. The committee is to be composed of representatives from the different branches of the government, especially from the ministry of agriculture and imperial estates, and from the Imperial Academy of Sciences, as well as experts in hydraulics, geology, agriculture and water rights. The subjects under the jurisdiction of the committee are measures relating to the conservation, increase, and regulation of the water supply and the laws relating thereto; a survey of the data available with reference to drafting a general water law; questions relating to the management of water by private parties; technical questions involving the interests of landed properties of the state, town, or private persons; and the settlement of disputes arising under the law relating to the construction of irrigation and drainage ditches through a neighbor's land.

Miscellaneous.—Dr. Wilhelm Rimpau, the distinguished agriculturist of Schlanstadt, Germany, died May 20, 1903, in his sixty-first year. Rimpau is best known in this country through his plant breeding work with cereals. He was one of the first to point out the almost universal self-fertilization of wheat, and maintained that different varieties of wheat could be grown in adjoining rows with little or no probability of crossing. Acting upon this belief he was able to establish his crossbred cereals and to conduct extensive experiments upon a limited area of ground. He devoted much attention to potato and sugar beet breeding, and was formerly prominent in the investigation on reclamation and cultivation of moor soils. He is said to have been one of the four founders of the *Deutsche landwirthschaftliche Gesellschaft.*

Prof. G. E. Day of the Ontario Agricultural College, has declined a tempting offer to go to South Africa as secretary of agriculture for the Orange River Colony. A strong stand for his retention at Guelph was made by representatives of the live stock interests, who paid a high tribute to his sterling qualities and excellent work, in an interview with the premier and the minister of agriculture for Ontario.

W. A. Noyes of the Rose Polytechnic Institute, and H. N. Stokes of the U. S. Geological Survey, have been appointed chemists in the Bureau of Standards in this city.

We note from *Science* that the professorship of forestry at the Royal Agricultural College at Cirencester, which has been vacant since the death of the late Sir Henry Gilbert, has now been filled by the appointment of Dr. W. Schlich, late inspector general of forests for the government of India and principal professor of forestry, Coopers Hill.

A canvass has been made with reference to the organization of a society for horticultural science, which would meet in connection with kindred societies such as the American Association for the advancement of Science and the American Pomological Society. The matter has been promoted by Prof. S. A. Beach of the New York Geneva Station. It will be considered in conjunction with the meeting of the American Pomological Society at Boston, September 10–12, and if sufficient interest is manifested a permanent organization will be formed.

A call has been issued for the convention of the Association of American Agricultural Colleges and Experiment Stations, to be held in this city beginning Tuesday, November 17, 1903.

Notice has been received of an international dairy congress to be held at Brussels, September 8, 9, and 10. Among the subjects to receive consideration special mention is made of (1) an international agreement for the repression of adulteration of dairy products, (2) the hygiene of milk and its products, and (3) the formation of an international dairy association. The congress will also be open to the presentation of papers and discussion on all subjects pertaining to dairy science and technics.

The American Grape Acid Association, 318 Front St., San Francisco, Cal., offers a bonus of $25,000 to the person who can devise a process for the use of grapes for grape acid. The association desires the best formula, and the right to use the same, by which grapes containing 20 per cent saccharine material may be turned into tartaric acid at a price that will admit of placing the product upon the market. This offer closes December 1, 1904, when all papers are referred to the following jury: Percy T. Morgan, president of the California Wine Association; Andrea Sbarboro, president of the Manufacturers' and Producers' Association of California; E. W. Hilgard, director California Agricultural Experiment Station; C. de Guigne, president of the American Cream Tartar Co., and A. Schilling, of the firm of A. Schilling & Co., the decision of 3 out of the 5 being final. The association invites correspondence regarding this matter.

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EXPERIMENT STATION RECORD.

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Among the important scientific meetings held during the past summer and early fall were several whose fields border on agriculture and horticulture, and which were this year of rather special importance. This was the case despite the tendency on the part of a considerable number of societies to change the time of their principal meetings from the summer to the winter season. The month of September was especially rich in such meetings, and short accounts of several of them are given in the present issue.

By far the largest meeting of this kind was the Eleventh National Irrigation Congress, held at Ogden, Utah, September 15–18. This was attended by nearly 1,500 delegates and visitors, the largest attendance in the history of the congress, and attracted specialists from the agricultural colleges and experiment stations throughout the irrigated region.

The Secretary of Agriculture was present as a guest of the congress and presented a paper setting forth quite fully the work of his Department in relation to irrigation and the needs of that region. This paper was received with much interest and appreciation, and a resolution indorsing the work of the Department was unanimously adopted in open session.

An extended programme of general and technical papers was provided, but so much time was taken up in general addresses and debates that the majority of the special papers were presented only by title. The interest of the congress was largely centered in the plans and projects of the reclamation service under the national irrigation law, and the repeal of certain land laws. The lengthy debate on the policy of repealing the desert land act, the timber and stone act, and the commutation clause of the homestead act was concluded by a compromise resolution asking Congress to amend the laws so as to prevent fraud.

A novel and interesting feature of the congress was a very fine display of the products of irrigation, exhibited in competition for prizes. The prizes consisted of four silver cups, valued at $500 each,

donated by private parties, and were for the finest fruit (won by Idaho), the best display of barley (won by a Montana malting company), the finest hops (won by North Yakima, Wash.), and the best sugar-beet exhibit (won by a farmer of Garland, Utah). In addition, the Utah Station had an interesting exhibit illustrating some very striking results of irrigation experiments on wheat, rye, and sugar beets, and the Wyoming Station made a fine showing of barley.

The meeting of the American Veterinary Medical Association at Ottawa developed a unanimity of opinion regarding the desirability of further improving veterinary instruction at some of the less thorough institutions. This is made necessary by the rapid progress in veterinary medicine, as a result of the extensive scientific investigation which is being carried on throughout the world, and by the increased demands upon veterinarians in public positions and in private practice for thorough equipment and preparation in their profession. A proposition for systematic supervision of veterinary instruction throughout the United States and Canada by the association, with a view to improving the standard of such instruction, met with very general approval.

Perhaps the most important scientific event of the meeting was the discussion on the subject of tuberculosis. On the one hand, it was shown conclusively that human and bovine tuberculosis may be intertransmissible, and in view of the evidence presented this conclusion was generally accepted by the members of the association. On the other hand, the successful experiments of Hon. W. C. Edwards, of Rockland, Ontario, in the application of the Bang method, the results of which were inspected by the members of the association, demonstrated the practicability of this method on a large scale and showed that it is comparatively easy for the stock raiser to eradicate tuberculosis from a herd without sacrificing valuable animals.

It is interesting to note that some of the results relative to tuberculosis announced at this meeting received strong corroboration at the International Congress of Hygiene and Demography, held at Brussels September 2–8. This congress was largely attended by physicians and veterinarians from European countries and America.

The announcement of the results arrived at by the German Imperial commission precipitated a long and rather heated discussion relative to the duality of tuberculosis, during which the adherents of the Koch theory were compelled to admit the possibility of transmitting the disease between man and animals. The sense of the congress was expressed in a resolution recognizing the possibility of the intertransmission of tuberculosis, and urging that the usual sanitary precautions for the prevention of such intertransmission should be continued in force without abatement.

Another important announcement made at this international congress was a report by Arloing to the effect that he had succeeded in immunizing cattle against tuberculosis by inoculation with attenuated cultures of tubercle bacilli. The results obtained by von Behring, McFadyean, Pearson, and others, previously noted,[a] are thus substantially corroborated.

It will be remembered that von Behring's method consisted in producing a mild form of tuberculosis in cattle by inoculation with an attenuated culture of the bacilli. The best results were obtained from the use of bacilli of human origin which had been cultivated on artificial nutrient media for a number of years. It was found preferable to apply this method of immunization to young cattle from five to seven months old, which received intravenously one milligram of a serum culture and four weeks later twenty-five milligrams of the same culture. The first inoculation usually produced a slight elevation of temperature, some loss in weight, and a susceptibility to tuberculin. The symptoms soon disappeared, however, and the animals were then found to be highly resistant to inoculation with large quantities of virulent tubercle bacilli.

Various modifications of this method have been employed by von Behring and other investigators, but the results obtained in Germany, the United States, and France agree in indicating that a high resisting power or practical immunity may be produced in cattle by this method.

The biennial meeting of the American Pomological Society at Boston was the occasion of the formation of a new scientific organization by the horticulturists in attendance, and within the society several new matters of general importance were considered. Among these were the packing of fruit under Government supervision, such as is exercised in Canada; the scoring of fruit according to a definite scale of points, for which no satisfactory basis has yet been devised; and the nomenclature of new varieties.

Two important steps have recently been taken by the society which should tend to simplify the nomenclature of fruits by preventing the further duplication of names and the renaming of old varieties. These are the establishment of an ad interim committee on the examination of new fruits, and the adoption of a new code to govern the naming of fruits, the latter provided by a special committee on the revision of the rules of nomenclature which was appointed four years ago. While this action will not prevent confusion and fraud in variety names on the part of unscrupulous persons, it will guard against unintentional mistakes by providing a practical means for entering supposedly new varieties.

[a] E. S. R., 14, pp. 393, 495, 609.

The usual number of papers on the practical and technical phases of pomology were presented, which are noted quite fully in the account of the meeting given elsewhere (p. 204).

The new Society of Horticultural Science has at present no connection with the Pomological Society, and was organized by independent action. Its purpose is to foster the development of the scientific aspect of horticulture as distinct from its popular side; and it is expected to occupy a place not now filled by any other organization. For a long time American horticulturists engaged in research work or in teaching horticulture, particularly station and agricultural college men, have felt the need of an organization where they might discuss the technical features of their work. Previous to this time no place has been open to them. The numerous horticultural and pomological societies now in existence are organized along popular and commercial lines, and deal more particularly with the practice of horticulture.

The new organization proposes to concern itself primarily with the principles underlying horticultural practice, and the purely scientific and technical features of that art. Membership is to be open under certain restrictions to persons engaged in horticultural teaching and investigations. It will include for the most part the horticulturists of the experiment stations and agricultural colleges, and such other scientific men and investigators in different sections of the world as are engaged in work bordering on horticultural lines.

With reference to the matter of affiliation, there was a feeling shared by many that if the society affiliated with any other organization it should be with some scientific society from which it might derive inspiration for a higher order of work, rather than with a society organized along popular lines. This matter was finally left in the hands of a special committee, to be reported upon at the next meeting, as was also the question of issuing a periodical publication.

It is believed that the organization of this new society will prove of special value to experiment station horticulturists. It should have a tendency to systematize horticultural work and to stimulate it along investigational lines, besides serving as a rallying place for consultation and discussion. An examination of the literature of the experiment stations shows a considerable amount of research work bearing on horticulture, but this is not systematized or correlated to the extent that it is in some other branches of agriculture. Much of the work is disjointed, many problems are untouched, and still others need rounding out.

Provision is made by the society for the assignment of special subjects to referees and alternates for investigation, and several such assignments were made at the first meeting. It is intended to make these investigations systematic and comprehensive, including the chemistry, soil physics, physiological botany, etc., of the problems in ques-

tion. With an active programme committee attention can be focused upon the extent and limitations of knowledge relating to different horticultural problems, and investigation thus stimulated in the direction where it is most needed.

Elwood Mead, chief of the irrigation investigations of this Office, returned in September from Europe, where he spent the summer in studying irrigation. Germany, Switzerland, Italy, and France were visited, but the greater part of his time was spent in Italy investigating the laws and practice of that country. Some of his observations are of special interest as showing the conditions under which irrigation has been developed and is managed in that humid country, and the manner in which some of its problems have been disposed of.

The reason for paying special attention to the valley of the Po was the similarity of its conditions to those of many sections in the eastern part of the United States. The rainfall of this part of Italy is about 40 inches a year, which is above that of Omaha, Kansas City, or Cincinnati. Farmers do not irrigate because they have to, but because it pays. In the greater part of the country the staple crops are the same as those of the northern part of the United States, corn, wheat, and clover being the leading products. The fields in which these are grown are also frequently planted with mulberry trees, which furnish food for the silkworms. Irrigation increases the yield of mulberry leaves about one-third. It enables a crop of corn to be grown after the wheat crop has been harvested, and doubles the yield of alfalfa and clover.

Rice and "marcite," two important crops, could not be grown without the aid of irrigation, and these can not be grown everywhere in the irrigated districts. The most profitable crop is marcite. The marcite fields are water meadows which are kept green the year through by running water over the land for a short time every day. In winter the water for this kind of irrigation comes principally from springs and is warm enough to keep the grass growing in the coldest weather. The grass is cut when it reaches a height of about 15 inches. It is chiefly used for feeding dairy cattle; and in the vicinity of large cities like Milan, where there is a local demand for milk and butter, the annual value of this crop is surprising, the product from some of the fields last year having sold for $300 an acre.

Land and water rights in the best marcite districts surpass in price the fruit lands of southern California, some of the farms near Milan being held at over $3,000 an acre, and rights in the canal selling for over $1,200 an acre. These are maximum prices and are far higher than the prices for lands and water rights where only wheat and corn can be grown. The minimum prices for lands with rights in the ditches in the districts recently brought under irrigation range from $160 to $180 an acre. Unirrigated land in the same neighborhood sells

for about $100 an acre. The appearance of the crops on the unirrigated lands in July and August was very like those of Kentucky, Indiana, or Missouri. The grass along the roadside was green and there were no sharply defined lines between the irrigated and unirrigated lands, as is true in the arid part of the United States. The same crops grow above ditches as below them, but there was a luxuriance and perfection in the irrigated farms not seen where they depended on rain.

The oldest canal inspected in Lombardy was constructed in 1150. This was built by the monks and was small and crooked, as were nearly all the canals built during the next five hundred years. The land could be farmed without irrigation and the building of canals meant increased expenditure, more people to cultivate the land, more houses for them to live in, and more barns in which to store the products. The large outlay in other directions, besides the cost of ditches, retarded this change, but in recent years progress has been rapid because of the need of finding employment and support for the dense population, there being about 380 people to the square mile in the province of Milan. There are several important ancient canals which are used for navigation, but many of the large irrigation canals have been built within the past fifty years. Among those visited, the last to be completed cost about $1,200,000 and has been finished about five years.

One of the instructive features of Italy's irrigation system is the way in which farmers have united in cooperative societies to build and operate canals or to distribute water from laterals. The largest of these societies is the Irrigation Association at Vercellesi. It has 14,000 members and controls the irrigation of 123,500 acres. It supervises the operation of over 7,000 miles of canals and ditches, with 40 water masters, and has about 150 miles of telephone lines. It buys water at wholesale and pays on an average $170,000 a year for the quantity purchased. The main society is divided into 40 subordinate societies, each of which elects a member to a general assembly which directs the policy of the association. This society transacts a business of about $600,000 a year.

One of the effects of these cooperative societies is the absence of friction and controversy between neighbors and neighborhoods, so often manifest in the United States. In the society above referred to there has never been an appeal from the decision of the manager, nor a single instance of a member's failing to pay his water rentals. In traveling through a region in which 27,000 cubic feet of water per second was being distributed every day there was not a single complaint of injustice or extortion, nor a fear expressed by any farmer that he would not receive his share of water when his turn came.

Much of the land is farmed by tenants, and as the area each cultivates is small, the general practice is to rotate the use of water along

laterals. These rotations are worked out with a system not approached anywhere in the United States outside of Utah, and a few ditches in southern California. In one instance the turn of a farmer was only one hour each week. It began at 7 o'clock Monday morning and ended at 8 o'clock. That was his single "rain" in seven days which could be absolutely relied upon. The farmer paid about $6 a year for the watering of each acre. In looking over the accounts of one association the largest annual payment by any farmer for water was found to be about $1,200 and the smallest 4 cents.

The Government exercises absolute control over the public streams and regulates the amounts each canal may divert. Parties wishing to build new canals must obtain the Government's consent. No perpetual rights to water are now granted. Appropriations are treated as franchises and their life is limited to thirty years. On the other hand, the Government is liberal in its treatment of meritorious projects, frequently extending aid by paying the interest on bonds issued to secure funds to build canals, the usual plan being to pay 3 per cent for the first ten years, 2 per cent for the second ten years, and 1 per cent for the third ten years, so that the interest payments by the Government end with the expiration of the water right. When the right expires it may be renewed just as franchises are renewed in this country.

In many sections of Italy canal companies have experienced the same losses and farmers suffered the same injury from seepage as are met with in this country. In some instances canals have had to be cemented for their entire length. Drainage has also had to follow canal building, as the seepage water fills the farmers' fields and the cellars of houses in towns. In recent years the granting of rights to build canals is frequently conditioned on the canal company constructing, along with its irrigation works, a complete system of drains to carry off the surplus water. In some districts drainage works have been built under an agreement whereby the canal company pays 60 per cent of the cost of drains and receives the water they collect, the farmers pay 20 per cent, and the municipality the remaining 20 per cent.

Mr. Mead believes that irrigation is certain to be a large factor in increasing the production of farms in the humid parts of the United States, especially in those sections of the country where streams have fall enough to permit water to be distributed by gravity, and in the Southern States where the long hot seasons will make the ability to supply water when needed of great value to farmers. Irrigation is not for the arid West alone. The conditions which make it pay in Europe exist here in equal measure, and with increasing population and higher land values canal building will become as important along both slopes of the Alleghenies as it now is along the southern and western slopes of the Alps.

ANNUAL MEETING OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION.

E. V. Wilcox, Ph. D.,
Office of Experiment Stations.

The fortieth annual meeting of this association was held in the council chamber of the city hall at Ottawa, Canada, September 1–4, 1903. An unusually large number of members and visitors were in attendance, and the meeting as a whole was considered to be one of the most important and instructive in the history of the association.

The usual order of business was observed on the first day, beginning with the address of welcome by Hon. Frederick Cook, mayor of Ottawa, followed by a response by Dr. D. E. Salmon of this Department; reports of committees and outgoing officers, as well as of State secretaries, and closing with the election of the following officers for 1903–4: President, R. R. Bell; vice-presidents, M. E. Knowles, J. G. Rutherford, C. J. Marshall, W. H. Dalrymple, J. E. Ryder; secretary, J. J. Repp; treasurer, W. H. Lowe.

The president, S. Stewart, in his annual address, called attention to the necessity of improving veterinary education by raising the standard of entrance requirements and the courses of study in certain veterinary colleges. He recommended that the association make a special investigation of the courses of study in all institutions which give veterinary instructions, in order that the status of veterinary courses may be made known to the profession, and especially to the association. He spoke in an optimistic manner regarding the prospects for young graduates from veterinary schools and the demands for qualified veterinarians in various parts of the country. Brief mention was also made of recent veterinary legislation in various States; and the subject of clinics in connection with meetings of the association was discussed and highly recommended.

The committee on intelligence and education made a report on literature which may be obtained by members of the association. This literature includes public documents, State publications, and various other books and pamphlets. The committee on army legislation reported that no further efforts had been made in that direction, but expressed the hope that conditions might soon become more favorable for legislation looking toward a more elaborate organization of the army veterinary staff.

The following resident State secretaries made brief reports: B. D. Pierce, of Massachusetts, briefly outlined the recent outbreak of foot-and-mouth disease in that State, called attention to the presence of mange in horses, and discussed the status of tuberculosis in cattle. Glanders was said to be on the increase. M. E. Knowles, of Montana, reported veterinary conditions as favorable. Tuberculosis was found in a considerable percentage of dairy cows, but not in range cattle. An efficient and satisfactory meat inspection service has been established in Montana. The position of inspector in the different cities, however, has been filled by physicians on account of the lack of qualified veterinarians.

C. J. Marshall, of Pennsylvania, stated that four large veterinary associations have been formed in Pennsylvania, and that veterinary affairs in general are in a flourishing condition. A movement is on foot for the establishment of meat and milk inspection in Philadelphia. Legislation is in force regarding the control of tuberculosis, the utilization of tuberculous meat, the regulation of rabies, and the quarantine of dogs. Brief notes were presented on veterinary instruction in the University of Pennsylvania, and on glanders, anthrax, and hemorrhagic septicemia, influenza of horses, canine distemper, and forage poisoning. Attention was called to the urgent demand for a reliable serum treatment for influenza in horses and distemper in dogs. The experiments for perfecting a method of immunizing cattle against tuberculosis are not yet concluded, but the belief was expressed that the method will prove practical. The application of the tuberculin test by laymen was condemned, and retesting was urged at least once in six months. C. H. Higgins, of Ottawa, gave a brief account of the control of glanders by the Dominion government, and presented notes on anthrax, blackleg, and tuberculosis in Canada. The conditions for veterinarians were considered favorable, but the usual fees too small. T. E. Robinson, of Rhode Island, stated that the veterinary profession in his State was in better condition than ever before. A State veterinary association has been formed, but thus far no success has been had in securing veterinary legislation. G. W. Dunphy, of Michigan, reported that veterinary practice in his State had increased greatly during the past year, especially in country districts. This was attributed to an increase in the value of live stock. Rabies was said to have prevailed extensively throughout the State. Cases of tuberculosis, hog cholera, and glanders were observed.

The committee on pharmacopœia requested further instructions regarding its work, and this gave rise to considerable discussion of the character of the prospective volume and the place of its publication, but no definite action was taken.

M. E. Knowles presented a paper on Meat and Milk Inspection, in which attention was called to the importance of State control of meat

and milk inspection. Montana was the first State to pass a law regulating all the details of this inspection. A bill was introduced into the State legislature in 1897 and another somewhat different bill in 1901. Both of these failed. In 1903, however, a bill was enacted containing wise and stringent measures concerning this matter. At present there are 8 inspectors in service in the State. Dairymen began to fight the measure from the first for the purpose of testing its constitutionality. Some litigation of this sort is still pending, but decisions thus far obtained are favorable to the constitutionality of the law. The sanitary condition of the milk and meat supply has been much improved by the action of this law. The percentage of tuberculosis in the dairy herds thus far examined has varied from 18 to 30 per cent. D. E. Salmon, in discussing this paper, called attention to the present demand for milk and meat inspectors, the special requirements in regard to the qualifications of such experts, and the difficulties of obtaining enough qualified men. He argued that veterinary courses are defective in respect to instruction on the subject of meat inspection, and that in his opinion all inspectors should be veterinarians. J. Law agreed that veterinary instruction in most colleges is still defective with regard to the subject of meat inspection, and suggested that more attention might be paid to this subject if the salaries of meat inspectors were higher.

Hon. Sidney Fisher, Minister of Agriculture, addressed the association on the subject of the importance of veterinary science to agriculture. Attention was called to the cosmopolitan nature of veterinary science, due to the general spread of infectious diseases and the similarity of conditions throughout the civilized world. The veterinary conditions of the United States and Canada were considered as being practically the same, and the results obtained in either country were mutually useful. The prominence of the live-stock industry in both countries indicates the importance of veterinary science to their agriculture. An account was given of the veterinary service of Canada and the close association between veterinary work and agricultural science in that country. A very optimistic opinion was expressed concerning the value of this international meeting and the prestige which would result to the association from it.

On the second day of the meeting the association was entertained at the Pine Grove Stock Farm of Hon. W. C. Edwards, Rockland, Ontario. The sessions of this day were devoted entirely to a discussion of the subject of tuberculosis. The first paper was by Hon. W. C. Edwards, and related to the results of his experiments with the Bang system among his own herds, the reacting and nonreacting herds being presented for the inspection of the members. This system of eradicating tuberculosis was introduced by Senator Edwards on his farm in 1898. A certain percentage of the herd was found to be

somewhat tuberculous, and the tuberculin test was made with all the animals. The healthy cows were then separated from the tuberculous cows and mainta ned in separate pastures. The healthy and tuberculous animals were never allowed to come in contact by any means either direct or indirect. It was found possible to raise the calves from tuberculous cows on sterilized milk, but this method proved too troublesome and healthy nurse cows were employed. Under these conditions it was found possible to raise at least 98 per cent of healthy calves where both the dams and sires were tuberculous. During an extensive application of the tuberculin test no harm whatever was observed as resulting from the use of this remedy, no case of abortion occurred, and no other bad effects of tuberculin could be determined. Senator Edwards believes as a result of his experiments that the only practical method at present is that devised by Bang. He argued against the stringent use of the tuberculin test in preventing the importation of infected animals, since ultimately each stock grower must apply the Bang method to his herd in order to keep it free from tuberculosis. Scrub cattle which react should be killed, but valuable animals should never be destroyed but rather used as breeders. Attention was called to the great importance of proper sanitary conditions in the control of tuberculosis. After an outbreak of tuberculosis his method consisted in cleaning the buildings with brooms, fumigating for 24 hours with brimstone, then with live steam for another 12 hours, and then treating with carbolized whitewash. Upon making a retest of the reacting animals a number of animals did not react, but they were nevertheless considered to be tuberculous and were kept separate. Spring was considered the best time for making the test. The King system of ventilation had been tried but found unsatisfactory for so cold a climate. It was recommended for southern regions.

Dr. D. E. Salmon presented a paper on Bovine and Human Tuberculosis. Attention was called to the relationship between human and bovine forms of this disease, and to the great differences of opinion which have prevailed with regard to the unity or duality of tuberculosis. In the laboratories of the Bureau of Animal Industry a number of differences have been noted in the morphology and virulence of types of tubercle bacilli of different origin. Dr. Salmon discussed Koch's work with special reference to variations observed in the virulence of bacilli from different human beings. The results obtained by various investigations since Koch's London address were critically discussed. It was stated that bovine and human tubercle bacilli have been compared as to their morphology and virulence. Positive results were obtained from inoculations of various animals with tubercle bacilli of human origin. Cultures of tubercle bacilli were obtained from

human lymphatic glands and human sputum which proved to be exceedingly virulent for cattle, goats, rabbits, and other experimental animals. The conclusions were reached that tuberculosis is mutually transmissible between man and animals; that the bacilli may pass through the walls of the intestines without causing any lesions in the intestines; and that the virulence for cattle of the bacilli from some of the cases of infantile intestinal tuberculosis give strong evidence of the transmission of the disease from animals to man. The great variety of ways in which man may become infected makes it absolutely impossible to determine by clinical observation the source of infection in any case of human tuberculosis.

In the protracted discussion which followed the reading of these two papers, the consensus of opinion of the association appeared to be that a practical method for the control and eradication of tuberculosis has been found, and that the positive assertions of Koch as to the nonidentity of human and bovine tuberculosis has been definitely disproved. Attention was repeatedly called to the danger from a laxity of opinion with regard to the intertransmissibility of bovine and human tuberculosis.

J. J. Repp read a paper on a microscopic study of a case of tuberculosis in a cow, with reference to the distribution of bacilli, which was illustrated with lantern slides. The tissues examined included those of the heart, liver, intestine, lung, and mediastinal gland. Tubercle bacilli were very numerous in the ulcers in the intestinal mucosa. The villi and glands of Lieberkühn were entirely obliterated in the intestinal ulcers. It was suggested that large numbers of bacilli must have been constantly passed with the feces, and that these must have constituted a dangerous source of infection. The heart capillaries were much thickened, but no bacilli were found in the muscles of the heart or of the intestines. No giant cells were observed in the tuberculous lung tissue.

V. A. Moore, of New York, discussed Avian Tuberculosis, on the basis of investigations made in California, where the disease was found to be very prevalent, and gave brief notes on the literature of the subject from studies made in Oregon, Delaware, and Michigan. The disease was found to be gradually increasing in infected flocks. According to the author's investigations in California, from 5 to 20 per cent of the fowls die annually from tuberculosis. In one flock of 1,450, 300 died from this disease. The symptoms were not characteristic. Anemia and paleness of the visible mucous membranes were generally observed. The temperature varied from 102 to 107°. The blood was pale, showing 2,600,000 red corpuscles per cmm., with an increase of the leucocytes. The lesions were found most frequently in the liver, which was sprinkled with gray tubercles, thus giving the disease the common name of "spotted liver." Immense numbers of

bacilli occurred in the liver tissues. The lungs were affected in only one case. The tubercles in the liver were caseous, small, easily separable, and frequently occurred in two distinct crops. Tubercles were also observed in the walls of the intestines and on the mesenteries. In a second form of the disease a cellular infiltration was observed. The bones were affected in one case only. Among 17 cases carefully examined, the liver was affected in 13. The bacilli were exceedingly numerous in all lesions, and greatly resembled those of human and bovine origin. Considerable differences were observed in the growth and morphology of these organisms on different culture media. Difficulty was experienced in making cultures from infected tissues. Inoculation experiments with guinea pigs and fowls gave no positive results. The disease was easily mistaken from its symptoms for infestation with air-sac mites, and other troubles. The tuberculin test was applied but without very satisfactory results on account of the normal variation in the temperature of birds.

C. H. Higgins gave a brief report on anthrax and blackleg, including a historical account of both diseases, and mention of symptoms in detail. Attention was called to the differential diagnosis of these diseases. It was urged that in cases of anthrax an autopsy is dangerous and usually to be avoided. The carcass should usually be buried. Notes were given on serum therapy and biological laboratories for the manufacture of this product. A. S. Wheeler in the discussion of this paper stated that he had had no bad results in 1,000 cases of inoculation for anthrax in Louisiana. V. A. Moore referred to many difficulties which he had experienced in the microscopic diagnosis of anthrax.

J. G. Rutherford presented a report on the uses of mallein in dealing with glanders. Glanders was said to be quite prevalent in the Northwest Territories and Manitoba. Good results have been obtained, however, from the Government control of this disease. Fresh outbreaks naturally occur from time to time, due largely to importation from other Canadian provinces or from the United States. In some cases mallein appeared to exercise a curative effect. The usual method of procedure in the control of glanders in Canada is as follows: When the disease is reported clinical cases are destroyed without the mallein test, while the exposed horses are tested. Reactors without clinical symptoms are then isolated and such horses are branded with "E. R." on the hoof. These animals are retested at the end of 40 days, after which those which do not react are not so closely guarded. The third test is made after 60 days, at which time those that react are killed. No indemnity is paid for any glanderous animals. As a rule horses are not killed if improvement is noted during the period of quarantine. After 90 days, reactors are killed while nonreactors are considered comparatively safe. Lesions are always found in reacting horses,

while the glanders bacilli are never present in lesions in horses which have ceased to react. Few horses react more than three times. The speaker therefore believed that mallein may exercise a curative effect.

D. K. Smith briefly discussed malignant tumors, which he stated need further study. Their histological structure is well known but their etiology is quite doubtful. Mention was made of the various theories devised for explaining the cause of tumors, including the embryonic, inflammatory, and microbic theories. A call was made for a systematic study of these growths, and the hope was expressed that the cooperation of veterinarians along this line might lead to valuable discoveries.

A. S. Wheeler related some experiments with stomach worms in sheep. *Strongylus contortus* was reported as very prevalent in the flock of sheep at Biltmore, N. C., where 66 sheep died. The author suggested that possibly the eggs of this worm are taken into the stomach from the outside of the udder of the ewe. Sucking lambs raised on gravel and wood floors which had been thoroughly disinfected became badly infested with the stomach worm. Experiments were made in introducing male stomach worms directly into the fourth stomach, but this apparently was without results. Turpentine in 2 to 4 oz. doses was used without beneficial results. Many of the lambs died with the stomach full of worms. Fluid extract of spigelia and senna in 2 to 4 oz. doses had no therapeutic effect. Benzine in 4 oz. doses was equally ineffective, and many fatalities resulted from it. Chloro-naphtholeum in 6 oz. doses also proved ineffective. A number of experiments were tried in applying vermicides directly to the worms in glass vessels. These showed that a 5 per cent solution of chloro-naphtholeum would destroy the worms in a few minutes; turpentine and santonin had no effect; lysol proved quite efficient, and coal-tar products in general were most satisfactory remedies. Great difficulty was experienced in getting the remedies into the fourth stomach and in distending this organ. Some success was had in reaching the fourth stomach by means of a probang, and experiments were made in introducing the vermicide directly by means of a trochar and canula from the outside. In these experiments 50 per cent of success was had with chloro-naphtholeum. This method of introducing vermicides, however, is considered to be impracticable for the ordinary sheep raiser.

Dr. P. A. Fish presented a paper on The Effect of Certain Drugs upon Blood Pressure and Cardiac Inhibition. The usual apparatus for determining blood pressure was employed and the carotid artery was connected with the apparatus. Various drugs were injected intravenously. It was found that the vagus nerves of the two sides of the body vary greatly in the power of controlling the heart action. In dogs there was a decrease in cardiac action after stimulation of the vagus

nerve. The blood pressure was temporarily much reduced: respiration was at first inhibited, then increased in power and frequency. In the horse a strong stimulation of the vagus caused death. The pulse was rendered intermittent. Similar results were obtained in experiments with calves. The cow exhibited no inhibition of the heart action, but a great temporary increase. Eserin sulphate increased the force of the heart beat and slowed down its action. Nitroglycerin injected into the horse caused a fall of blood pressure, but increased the amplitude of the cardiac action. Barium chlorid, in doses of 12 grains, increased the force of blood pressure. Stimulation after the administration of this drug had an immediate inhibitive action. When the vagus was cut before being stimulated the action was similar. The dog exhibited an enormous increase in blood pressure and force of the heart action after treatment with barium chlorid. Atropin sulphate in doses of $\frac{1}{4}$ grain paralyzed the inhibitive action of the vagus in the dog. When the vagus was subsequently stimulated the blood pressure was increased. A cat treated with large doses of barium chlorid showed a great increase in blood pressure. The cardiac and diuretic effects of barium chlorid were similar to those of digitalis.

W. Dougherty presented a plan for the formation of a mutual benefit society of the veterinarians of the United States and Canada. After a thorough discussion of the matter a committee was appointed to investigate the desirability of forming such a society, and report at the next meeting.

The by-laws of the association were amended so as to make the time of meeting hereafter the third Tuesday in August in place of the first Tuesday in September. While the place for the next meeting was not definitely determined, the executive committee was requested to consider the proposition to meet at St. Louis.

During the various sessions of the meeting nearly 100 new names were added to the list of active members.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The standardization of analytical methods, H. D. Richmond (*Jour. Soc. Chem. Ind., 22 (1903), No. 11, pp. 676, 677*).—A general discussion recommending combined work and discussion as "the best method of finding out errors of and laws underlying a method."

The standardization of commercial methods of analysis, especially those applied to brewing materials, A. R. Ling (*Jour. Soc. Chem. Ind., 22 (1903), No. 11, pp. 677–684*).—The author maintains "the necessity of investigating certain empirical methods of analysis with a view of ascertaining what they actually measure when carried out under certain defined conditions. This constitutes the standardization of the method in question, and in my opinion ought be attempted only after the conjoint deliberations of those in the habit of carrying out the determinations and of applying the results. It is the first step toward the elaboration of standard methods. . . . It by no means follows that the ultimate result of such work will be to reduce all methods to one pattern."

On the unreliability of the citrate method for determining phosphoric acid in Thomas slag, N. von Lorenz (*Chem. Ztg., 27 (1903), No. 41, pp. 495, 496*).—Böttcher's later method, involving a preliminary test for silica (E. S. R., 14, p. 1042), is considered too complicated for practical use. Choice seems to lie between the methods of Woy (E. S. R., 14, p. 1042) and the author (E. S. R., 13, p. 14). The latter is considered more rapid.

Note on the citrate solution used in phosphoric acid determination, A. Verweij (*Ztschr. Analyt. Chem., 42 (1903), pp. 167, 168*).—Old citrate solution is stated to give too high results, due to silica dissolved from the glass vessels in which it is kept.

The determination of phosphoric acid in organic substances by Neumann's method, E. Poher (*Ann. Sci. Agron., 1902–3, I, No. 3, pp. 441–447*).—Neumann's later method of digestion in a mixture of sulphuric and nitric acids is preferred as more rapid and convenient than the older method using sulphuric acid and ammonium nitrate.

Nitrogen and its most important compounds, L. Spiegel (*Der Stickstoff und seine wichtigsten Verbindungen. Brunswick: Friedrich Vieweg & Son, 1903, pp. XII+912, figs. 6*).—A very full summary of information on this subject with numerous references to literature. Agricultural chemists will find the chapters on alkaloids, protein compounds, and analytical methods of special interest.

On the determination of nitric acid by the Ulsch method, F. Štolba (*Časopis pro Průmysl Chem., 13 (1903), p. 171; abs. in Chem. Ztg., 27 (1903), No. 53, Repert., p. 158*).—The author calls attention to the fact that the results by this method are sometimes too high on account of the presence of nitrites in the soda or potash solution used. He advises the testing of the alkali solution before use by distilling with aluminum.

The use of the Schloesing method for determining nitric nitrogen in presence of organic matter, P. LIECHTI and E. RITTER (*Ztschr. Analyt. Chem., 42 (1903), No. 4, pp. 205–232*).—The authors report tests which refute Pfeiffer and Thurmann's objections to this method and show its reliability. Certain modifications in detail are described.

Action of potassium permanganate on indigo, with reference to the determination of nitrates by the indigo-carmine method, W. R. LANG and W. M. WILKIE (*Jour. Soc. Chem. Ind., 22 (1903), No. 11, pp. 673, 674*).—The discordant results of a series of experiments with dilute potassium nitrate, sulphuric acid, and indigo titrated with tenth-normal potassium permanganate lead to the conclusion that "if this method of estimating nitrates is to be of any accuracy, an absolute similarity of conditions, both as regards time and temperature, must be observed."

Tintometric estimation of nitrites and nitrates in water, F. W. RICHARDSON and P. HOLLINGS (*Jour. Soc. Chem. Ind., 22 (1903), No. 10, pp. 616, 617*).—Sutton's phenol-disulphonic acid method using Lovibond's tintometer is recommended.

The preparation of ammonia-free water for water analysis, J. B. WEEMS, C. E. GRAY, and E. C. MYERS (*Contrib. Dept. Agr. Chem., Iowa State Col. Agr. and Mech. Arts, No. 5, pp. 112, 113*).—The use of sodium peroxid in preparing ammonia-free water is described.

A new method for the titration of free and combined sulphuric acid, W. MÜLLER (*Ber. Deut. Chem. Gesell., 35 (1902), No. 9, pp. 1587–1589; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 5, p. 478*).—The method proposed depends upon the fact that when a solution containing sulphuric acid is added to a hot solution of benzidine hydrochlorate sulphuric acid is precipitated and may be removed by filtration. The amount of sulphuric acid may be calculated by titration of a measured quantity of the benzidine reagent before and after precipitation by means of soda solution and phenolphthalein. The reaction which occurs is shown in the following equation: $R_2SO_4 + C_{12}H_8(NH_2)_2.2HCl = 2RCl + C_{12}H_8(NH_2)_2.H_2SO_4$.

A volumetric method of estimating free and combined sulphuric acid, G. FRERICHS (*Arch. Pharm., 241 (1903), No. 2, pp. 159, 160*).—The method, which is briefly described, depends upon the fact that free and combined sulphuric acid give a silver salt insoluble in alcohol.

Note on the determination of solids in the analysis of vinegars, W. FREAR and C. P. BEISTLE (*Pennsylvania Sta. Rpt. 1902, pp. 165–168*).—Comparative tests were made of drying to a constant weight in a water oven at about 100° C., and drying at ordinary room temperature over sulphuric acid. The solids determined by drying in the water oven averaged 1.39 per cent and by drying over sulphuric acid 2.03 per cent, making a difference by the 2 methods equivalent to 0.64 per cent of the entire vinegar. To determine the nature of this loss elementary analyses were made of the residues, which showed an average percentage of carbon calculated to the original weight of vinegar used of 0.48 by drying in the water oven and 0.72 by drying over sulphuric acid, making a difference of 0.24 per cent. The difference was greater than could be accounted for by the excess of the acetic acid in the residues obtained by drying over sulphuric acid. As the residue from the water oven was not acid the destruction of the fixed acids or their neutralization by bases set free from other combinations was indicated. "These results demonstrate beyond cavil the fact that the usual method of determining vinegar solids by evaporation at 100° C. is attended by the elimination, either by volatilization or decomposition, of constituents other than water, alcohol, and acetic acid, and that this loss of materials properly classed among the solids is entirely too great to be overlooked in any investigation requiring an absolute determination of the quantity of such materials. They further show that, while the ordinary method is still practicable where purely relative

results are sufficient, it is highly needful that the time of evaporation, surface exposure, and other details affecting the rate of evaporation be arbitrarily fixed and rigidly adhered to."

The methods of estimating mustard oil and the effect of the formation of mustard oil from Indian rape in the digestive tract of ruminants, O. HAGEMANN and W. HOLTSCHMIDT (*Fühling's Landw. Ztg., 51 (1902), Nos. 23, pp. 869–871; 24, pp. 895–901*).—The conditions of temperature, moisture, etc., under which mustard oil is formed were studied with especial reference to the conditions prevailing in the digestive tract of ruminants.

The choice of an antiseptic for preserving samples of milk for analysis, M. LINDET (*Rev. Gén. Lait, 2 (1903), No. 16, pp. 370–372*).—In this brief report, which is based upon numerous communications received from analysts in different countries, the author as referee recommends the use of potassium bichromate (0.5 gm. per liter) or formalin (60 drops per liter) for the preservation of samples of milk for analytical purposes.

Some unknown and some little known oils, J. J. A. WIJS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 11, pp. 492–496*).—Chemical studies are reported of oil made from the seeds of *Echinops ritro*, *Perilla ocymoides*, watermelon, tea, garden cress, radish, and mustard.

A new mill for laboratories, T. KÖRNER (*Chem. Ztg., 27 (1903), No. 42, pp. 502, 503, fig. 1*).—The mill is constructed on the principle of beating rather than grinding. The material is kept thoroughly stirred by means of a current of air, the particles of the desired degree of fineness passing out through a sieve at the bottom of the mill. The interior of the mill is readily accessible and is easily cleaned.

International Congress of Applied Chemistry at Berlin, June 2–8, 1903—Agricultural chemistry (*Chem. Ztg., 27 (1903), No. 47, pp. 564, 565*).—A brief account is here given of discussions of the following subjects: Analysis of Nitrates, by H. Fresenius; The Determination of Potash by Means of Perchlorate, by Precht; The Direct Determination of Phosphoric Acid as Molybdic Anhydrid, by R. Woy; The Iodometric Determination of Phosphoric Acid, by Klason; The Report of the Committee on Analysis of Fertilizers and Feeding Stuffs, by von Grueber; The Construction of Balances for Analytical Work, by Felgenträger; A New Gravimetric and Volumetric Method of Determining Ammonia, by E. Riegler; and The Statement of the Results of Analysis, by W. Fresenius and Christomanos.

BOTANY.

A monograph of the genus Sorbus, T. HEDLUND (*K. Svenska Vetensk. Akad. Handl., 35 (1901), No. 1, pp. 1–147, figs. 37*).—In addition to a botanical study of the species of Sorbus, the author gives an account of their distribution, economic value, varieties, hybrids, and other modified forms. Fifty-five species are recognized and a number of forms and hybrids are considered distinctive enough to receive definite names.

A text-book of plant physiology, G. J. PEIRCE (*New York: Henry Holt & Co., 1903, pp. VI+291, figs. 23*).—This text-book is the outgrowth of the author's lectures at Leland Stanford University, and is designed as a treatise on plant physiology that shall cover the field less exhaustively than is done by Pfeffer and others, but more fully than in the so-called Bonn text-book. The author presents the main facts of plant physiology, adopting a conservative attitude regarding the various hypotheses of the phenomena of plant life and suggesting definite problems for further investigation. No attempt is made to give laboratory directions, as the book is strictly a text-book, which should be supplemented by laboratory work under the direction of the teacher. The subjects of respiration, nutrition, absorption, and movement of water; growth, irritability, and reproduction are treated in detail, and the copious

references to literature given in footnotes serve as a considerable bibliography to the subjects treated. This new plant physiology will be found an important addition to the rapidly increasing American literature of botany.

On the physiology of the anaerobic growth of the higher plants, A. Nabokikh (*Selsk. Khoz. i Lyesov., 208 (1903), Feb., pp. 350–388; Mar., pp. 568–602*).

The cohesion theory of the ascent of sap, H. H. Dixon (*Sci. Proc. Roy. Dublin Soc., 10 (1903), No. 4, pp. 48–61*).—This paper is a defense of the author's theory regarding the ascent of sap and a criticism of the conclusions of others relating to that theory.

Formation of the spores in the sporangia of Rhizopus nigricans and of Phycomyces nitens, D. B. Swingle (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 37, pp. 40, pls. 6*).—A technical paper giving the results of studies of the formation of the spores of *Rhizopus nigricans* and of *Phycomyces nitens*.

Bacteria in modern economic agriculture, A. Schneider (*Pop. Sci. Mo., 63 (1903), No. 4, pp. 333–343*).—A popular account is given of nitrogen assimilation by leguminous plants through the bacteria occurring in the tubercles upon their roots.

Outline of the history of leguminous root nodules and rhizobia, with titles of literature concerning the fixation of free nitrogen by plants, A. Schneider (*Minnesota Bot. Studies, 3. ser., 1903, pt. 2, pp. 133–139*).—A brief historical résumé is given of investigations regarding the assimilation of nitrogen through the root tubercles of leguminous plants, and a list of titles of recent publications bearing upon this subject is appended.

The inoculation of leguminous plants and its practical importance, Hiltner (*Chem. Ztg., 27 (1903), No. 49, p. 611*).—A brief general discussion before the section of agricultural chemistry of the recent International Congress of Applied Chemistry.

Alinit, its bacterial composition and physiological rôle in the soil, Severin (*Vyestnik Imp. Russ. Obsh. Akklimat. Zhiv. i Rast. Bakt. Agron. Stantz., No. 9, pp. 36–57; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 1, pp. 116, 117*).—The author investigated a preparation of Alinit obtained from Bayer's factory and found that it consisted of 2 micro-organisms: (1) *Bacillus ellenbachensis*, which is described by all investigators, and another—its race variant—differing from the former mainly by its inability to reduce nitrates. The author proposes to name it *B. ellenbachensis β*. When growing in horse manure both races appear to show little activity in destroying organic matter; neither induces ammoniacal fermentation in urine. The author, on the basis of his experiments, concurs with the conclusion of the majority of investigators that Alinit is of no value for agricultural practice.—P. FIREMAN.

Michigan mushrooms, B. O. Longyear (*Michigan Sta. Bul. 208, pp. 79–100, figs. 21*).—Descriptions are given of a few of the more common edible fungi known to occur within the State. Various species of Morchella and some of the puffballs are described.

METEOROLOGY—CLIMATOLOGY.

Climatic conditions at California substations, C. H. Shinn (*California Sta. Bul. 147, pp. 8, 30, 45, 63, 90, 102*).—Observations on temperature, rainfall, frosts, etc., during several years are recorded for the Foothills Substation near Jackson, the Southern Coast Range Substation at Paso Robles, the San Joaquin Valley Substation at Tulare, the Southern California Substation near Pomona, and the Forestry substations near Santa Monica and Chico.

Meteorological observations, W. T. Ellis, R. Robertson, W. S. Blair, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1902, pp. 47, 231, 263, 318, 356, 389*).—Observations of the same character as those of previous years are recorded.

Meteorological observations, Moscow, Idaho, 1901, J. E. Bonebright (*Idaho Sta. Rpt. 1902, p. 23*).—A tabular summary of observations on temperature, pressure, precipitation, cloudiness, and late and early frosts. The mean temperature for the year was 47.46°, the precipitation 22.56 in., the barometric pressure 27.25 in., number of cloudy days 121. The last killing frost in the spring occurred May 19, the first in the fall September 16.

Meteorological observations, J. E. Ostrander, S. C. Bacon, and F. F. Henshaw (*Massachusetts Sta. Met. Buls. 172, 173, 174, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during April, May, and June, 1903. The data are briefly discussed in general notes on the weather of each month.

Summaries of temperature, rainfall, and sunshine, E. F. Ladd (*North Dakota Sta. Rpt. 1902, pp. 13–19*).—Observations at Fargo and at several other places in North Dakota during 1902 and previous years are summarized. The mean temperature at Fargo during 1902 was 39.4° F., the rainfall 23.16 in. The average rainfall at Fargo for 11 years ending with 1902 was 20.62 in., for the State (17 places) during 10 years 18.5 in. The hours of recorded sunshine at Fargo during 1902 were 2,034.8 or 45.2 per cent of the possible.

Meteorology, C. W. Norris (*Pennsylvania Sta. Rpt. 1902, pp. 172–186, 451–479*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 14, p. 638). Monthly summaries of observations are given in the body of the report and the detailed record in an appendix. The summary for 1901 is as follows:

Summary of meteorological observations, 1901.

	1901.	Growing season (Apr.-Sept.).
Barometer (inches):		
Mean	29.993	
Highest	30.709 (Jan. 3)	
Lowest	29.280 (Jan. 27)	
Temperature (° F.):		
Mean	48.1	63.6.
Highest	94 (July 1)	94 (July 1).
Lowest	—2 (Dec. 22)	25 (Apr. 1).
Mean daily range	17.1	18.8.
Greatest daily range	37 (Mar. 18–Dec. 15)	35 (Apr. 28–29).
Least daily range	3 (Jan. 10-11)	
Mean daily relative humidity (per cent)	81.7	78.8.
Rainfall (inches):		
Total	43.45	28.11.
Greatest monthly	8.97 (Aug.)	
Greatest daily	3.19 (Aug. 18)	3.19 (Aug. 18).
Number of days on which 0.01 in. or more of rain fell	141	72.
Mean percentage of cloudiness	48.9	48.1.
Number of days on which cloudiness averaged 80 per cent or more.	109	55.
Average hours of sunshine per day		7 h. 39 m.
Maximum velocity of wind per hour (miles)	30 (Dec. 14)	
Last frost in spring		June 9.
First frost in fall		Sept. 30.

Report of the meteorologist, N. Helme (*Rhode Island Sta. Rpt. 1902, pp. 379–395*).—This includes general notes on the weather during the year ended June 30, 1902, and a tabulated record of observations at Kingston on temperature, precipitation, cloudiness, and prevailing winds during each month from July, 1901, to June, 1902, inclusive, with a summary for the year ended June 30, 1902. The latter summary is as follows:

Temperature (degrees F.).—Maximum, 93, July 1, 1901; minimum, 1, January 4, 1902; mean, 48; highest monthly mean, 72, July, 1901; lowest monthly mean, 24.8, January, 1902; highest daily mean, 80, July 1, 1901; lowest daily mean, 8, January 4, 1902. *Precipitation* (inches).—Total (rain and melted snow), 53.14; greatest

monthly, 10.3, December, 1901; least monthly, 1.34, May, 1902; greatest in 24 consecutive hours, 2.42, December 29, 1901; snowfall—total, 53.5; greatest monthly, 31.5, February, 1902; least monthly, 2.5, November, 1901. *Weather.*—Number of clear days, 138; number of fair days, 116; number of cloudy days, 111; number of days on which there was precipitation of 0.01 in. or more, 109. *Prevailing wind*, west and southwest.

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1903, No. 1, pp. 23, pl. 1*).—This is the usual summary of observations on the weather for the season of navigation; precipitation and ice during the winter of 1902–3; opening of navigation for the season of 1903; and maximum wind velocities, April to December.

Meteorological observations on Ben Nevis, A. Buchan et al. (*Rpt. British Assoc. Adv. Sci., 1902, pp. 93–97*).—Observations on temperature, pressure, rainfall, humidity, velocity of wind, sunshine, cloudiness, and casual phenomena are summarized for each month of 1901.

The meteorological year, 1902 (*Bul. Sta. Agron.* [*Laon*], *2. ser., 13* (*1902*), *pp. 7–16*).—Observations at Laon on atmospheric pressure, temperature, rainfall, cloudiness, condition of crops, etc., are recorded for each month of the year.

The geographic determinants of climate, L. Dumas (*L'Ing. Agr. Gembloux, 13* (*1903*), *No. 8, pp. 329–336, figs. 2*).—The influence of the movements of the sun on climate is discussed and shown graphically. It is claimed that weather conditions are most unsettled during the passage of the sun from the southern to the northern hemisphere, less so during the return in the opposite direction. The principal centers of disturbance as regards Europe seems to be the Venezuelan llanos and the South Saharan desert. They cause a predominance of a marine climate over a continental climate in western Europe. The influence of the moon in dissipating aqueous vapor and on rainfall and the formation of lunar halos and coronas are also briefly discussed.

Investigation of the upper atmosphere by means of kites in cooperation with a committee of the Royal Meteorological Society, W. M. Shaw et al. (*Rpt. British Assoc. Adv. Sci., 1902, pp. 77–80*).—Apparatus installed on the island of Crinan, west coast of Scotland, is described, and data for 68 flights are reported. The results indicate "that the apparatus and methods are effective for securing valuable information as to the upper air in various conditions of weather."

WATER—SOILS.

Evaporation from a water surface, E. F. Ladd (*North Dakota Sta. Rpt. 1902, pp. 20, 21*).—Observations were made as follows: "A galvanized iron tank 3 ft. square by 14 in. in depth painted black contained a second smaller tank 12 by 12 by 12 in. in dimensions, likewise blackened. These were sunk in a grass plat level with the surface of the ground. The small tank contained distilled water and this tank within the larger was surrounded with water. Daily measurements were made of the amount of evaporation, and the results by months are given. . . . The total amount of water evaporated from a water surface for the 5 months, May to September, inclusive, was 28.12 in., or an average of 5.624 in. per month, or a daily average of 0.183 in. The total rainfall for the same period of time was . . . but little more than one-half as much as the water evaporation for the same period, or an average of 2.864 in. per month, or an average daily rainfall of 0.0936 in., as compared with an evaporation of 0.183 in. per day."

Forests and underground water, A. Tolsky and E. Henry (*Ann. Sci. Agron., 1902–3, I, No. 3, pp. 396–422*).—Observations made in Russia and France are reported to show that the level of the ground water is decidedly lower under forests than under cleared land.

The movements of underground waters of Northwest Yorkshire, W. W. WATTS ET AL. (*Rpt. British Assoc. Adv. Sci., 1902, pp. 224–229, pl. 1*).—An account is given of observations by means of fluorescin. (See also E. S. R., 14, p. 847.)

Stock waters, F. W. TRAPHAGEN (*Montana Sta. Rpt. 1902, p. 64*).—The amounts of chlorin, sodium chlorid, sulphuric acid, and Glauber's salt in 3 samples of alkali waters are reported.

Water investigations, M. MONHAUPT (*Chem. Ztg., 27 (1903), No. 42, pp. 501, 502*).—Tests are reported which indicate that methyl orange is preferable to alizarin as an indicator in Pfeiffer's modification of Wartha's method for determining temporary and permanent hardness.

Soil moisture in relation to crop yield, S. FORTIER (*Montana Sta. Rpt. 1902, pp. 101–112, pls. 2, figs. 3*).—The apparatus used and methods followed in experiments with oats grown in metal tanks sunk in the earth are described. In order to keep the temperature of the soil surrounding the tanks uniform "oak barrels were cut in half and placed with their top edge about 14 in. below the surface of the ground. Gravel to the depth of a few inches was placed in the bottom and ordinary soil on top. Water was conveyed to the gravel through a $\frac{3}{4}$-in. iron pipe. It was hoped that this device would not only lessen the temperature in the lower portion of the tank, but that the water placed in the half barrel would be drawn up by capillarity and evaporated at the surface, thus tending to cool the upper portion. . . . To afford a convenient method of hoisting and weighing the tanks, a $\frac{1}{2}$-in. steel cable was stretched over supports 93.2 ft. apart and 14 ft. high. Differential pulley blocks were then suspended from a pulley on the cable and a strong bale and beam scale were attached to the blocks. . . . In applying irrigation water to the tanks, about two-thirds of the amount was spread over the surface, the balance was run through the hose pipe to the bottom of the vessel. . . . The evaporation and transpiration from the grain was about 16 per cent greater than the evaporation from the bare soil. For the period named, the former averages $1\frac{1}{7}$ in. and the latter $\frac{9}{10}$ in. per week over the surface. For the same period the evaporation from a water surface was 13 to 16 in. per week. . . . The crop in every case not only evaporated all of the irrigation water, but robbed the soil of part of the moisture which it contained at seed time." Observations on evaporation from stubble fields and from a water surface are also recorded.

The conservation of soil moisture in orchards, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 137–139*).—Studies in continuation of those of the previous year (E. S. R., 14, p. 127) on the variation in moisture content of orchard soils (1) cultivated throughout the season, (2) cropped part of the season with clover which was turned under as a green manure, and (3) cropped in clover or in sod throughout the season are reported. The author concludes that moisture is most effectively conserved in cultivated soil, but that sod exhausts the water supply more than cover crops.

Summer fallows, A. MACKAY (*Canada Expt. Farms Rpts. 1902, pp. 349–351*).—A brief discussion of observations and experience tending to show the advantages of summer fallowing. Different methods are described, but deep plowing, 7 to 8 in., before the last of June has given the best results in the author's experiments.

Conservation of soil fertility, F. W. TRAPHAGEN (*Montana Sta. Rpt. 1902, pp. 61–63*).—This is a comparison of the amount of fertilizing constituents removed from the soil by wheat, with the amount returned in irrigation water from 5 streams in Montana. The latter is shown to be much smaller than the former.

Note on the composition of the adobe soil of a hilltop, E. W. HILGARD (*California Sta. Bul. 147, pp. 119, 120*).—Mechanical and chemical analyses of a hard, black adobe clay used for an orange grove are reported. The soil contained over 80 per cent of very fine particles. Chemical analysis showed it to be of about the average composition for soils of this class and region except as regards potash which was low.

0.33 per cent. For so heavy a soil the amount of lime is considered somewhat low, 0.76 per cent. The soil contained 0.07 per cent of phosphoric acid and 0.16 per cent of nitrogen. The humus content was 1.85 per cent.

Soil investigations, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 132–136*).—Chemical analyses of soils from different parts of Canada are reported and briefly discussed.

A study of the arable soils of the Department of Aisne (*Bul. Sta. Agron. [Laon], 2. ser., 13 (1902), pp. 35–74*).—Partial chemical analyses of soils and subsoils from 27 cantons of the Department of Aisne, France, which were made for the purpose of preparing agricultural soil maps, are reported.

The amounts of nitrogen and organic carbon in some clays and marls, N. H. J. MILLER (*Quart. Jour. Geol. Soc., 59 (1903), pp. 133–140*).—This article discusses changes which organic matter undergoes in the soil, as shown by studies of Rothamsted, California, and other soils, and reports determinations of carbon and nitrogen in several samples of clays and marls. The amounts of these are shown to be considerable. "It seems very desirable that the organic matter present in the deposits which form the basis of many soils should receive far more attention than has hitherto been given to them."

The practical use of soil analysis: An analytical study of an Espinouse schist, H. LAGATU and L. SICARD (*Ann. École Nat. Agr. Montpellier, n. ser., 2 (1903), No. 4, pp. 267–290*).—Physical and chemical analyses of several samples of soil from an estate in the commune of Labastide, arrondissement of Castres, are reported with some discussion of the practical value of the analytical results.

Remarks on Loew's hypothesis concerning the rôle of lime in soils, A. DOJARENKO (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, pp. 183–187*).—Experimental data are reported to show that the beneficial action of lime is not entirely due to the neutralizing of the injurious effects of an excess of magnesia. Marked benefit was obtained in pot experiments with oats from applications of lime on soils which already contained more than enough of the substance to neutralize the action of the magnesia present according to the Loew hypothesis.

Bacteria of the soil, N. S. MAYO and A. T. KINSLEY (*Kansas Sta. Bul. 117, pp. 167–184*).—The bulletin includes a discussion of the general characteristics and functions of bacteria and of the conditions necessary to their growth, and reports the results of counts of bacteria in different kinds of soils, tabulated with reference to kind of soil, crop grown, depth, time of year, and locality. Sixteen species were isolated and are described.

Contributions to the morphology and the physiology of denitrification, J. G. LIPMAN (*New Jersey Stas. Rpt. 1902, pp. 183–241, pl. 1*).—The literature of this subject is reviewed and experiments with pure cultures of various denitrifying organisms are reported. The results of comparative tests of 8 pure cultures of soil organisms and one mixture show a wide variation in the capacity of these organisms for rendering the nitrogen of nutrient bouillon soluble, the mixture being more effective in this respect than the pure cultures (from 1.3 per cent with *Bacillus New Jersey* to 35.2 per cent with the mixtures in 15 days). Two new organisms, *B. New Jersey* and *B. New Jersey* var., were isolated from horse manure, and two, *B. 20* and *B. 21*, from cow manure. These were studied in different media, and their characteristics are described in detail. *B. 20* is stated to be similar to the *B. nitrificans* of Burri and Stutzer. The others are believed to be entirely distinct from any previously described organisms. A special study was made of the behavior of these organisms and *B. pyocyaneus* toward organic acids and salts, as well as various other sources of carbonaceous nutrients (carbohydrates). The results show a wide variation in the nutrient value of the organic substances tested, and also "prove that the development of the denitrifying bacteria is not necessarily proportionate to their denitrifying power. On the one hand, there may be considerable growth and

development with scarcely any reduction of the nitrate present in the solution; on the other hand, there may be a comparatively limited growth, accompanied by the complete reduction of the nitrate."

Data showing the variations in the capacity of the different organisms to transform nitrogen in nitrate bouillon are also reported.

The results of a study of the question of fixation of nitrogen by denitrifying bacteria indicate "that *B. pyocyaneus* has the power of fixing small quantities of atmospheric nitrogen; that this fixation is largely influenced by the organic compound used as the source of carbon and of energy. Lactic acid is decidedly superior to citric acid, but with thorough aeration, also, the latter can be used for the purpose. Furthermore, the amount of nitrogen fixed is influenced by the depth of the liquid layer, and other things being equal the greater the surface exposed the greater the amount of nitrogen fixed."

Studies of the nitrogen content of 15 soils (with subsoils) from different parts of New Jersey are reported.

FERTILIZERS.

Methods of steer feeding: Manurial results; Losses in manure, W. FREAR (*Pennsylvania Sta. Rpt. 1902, pp. 88–107; Bul. 63, pp. 6*).—In connection with a series of feeding experiments with steers (E. S. R., 13, p. 880) a study was made of the relative economy of (1) allowing the manure to accumulate during about 2 months (April and May, 1901) under the animals in cement-lined stalls, and (2) removing it daily and storing in heaps under a covered shed. The details of this study as here reported show that: "(1) The trampled manure suffered little loss of fertilizing constituents, though less than two-fifths of the dry matter of food and litter was recovered in the manure; (2) The covered-shed manure lost one-third of its nitrogen, one-fifth of its potash, and one-seventh of its phosphoric acid. Only one-third of the dry matter of food and litter was recovered in the manure. The potash and phosphoric acid losses must be explained by seepage of liquid manure into the clay floor. The loss of nitrogen is, however, chiefly due to volatilization of carbonate of ammonia; (3) The money value of the fertilizer constituents lost by the second as compared with the first method is equivalent to $2.50 for each steer stabled for six months; (4) Therefore, manure, if prepared upon a tight floor and with such proportion of litter that it can be trampled into a compact mass, loses very little, if any, of its fertilizer constituents so long as the animals remain upon it. This method of preserving steer manure is therefore distinctly superior to that of the covered shed, though the latter method may not always exhibit as great loss as that observed in this experiment."

On the preservation of barnyard manure by chemical means, H. IMMENDORF (*Mitt. Deut. Landw. Gesell., 18 (1903), No. 21, pp. 99–101*).—As a result of the experiments here reported the author concludes that sulphuric acid is unsatisfactory as a preservative because it is not easily obtained, is dangerous to handle, and imparts an acid reaction to the manure; superphosphate-gypsum in amounts ordinarily employed is very unreliable in its action, and kainit and gypsum are of no value. "Utilit," like sulphuric acid, is an effective preservative, but is expensive and is subject to much the same objections as apply to sulphuric acid.

Investigations relative to the use of nitrogenous materials, E. B. VOORHEES (*New Jersey Stas. Rpt. 1902, pp. 133–180*).—This is a report of a continuation of experiments of previous years (E. S. R., 14, p. 557), which "were undertaken mainly to determine the relative availability and value of nitrogen in farm manure and in the nitrogen salts and high-grade organic nitrogenous materials found in the market. In the study of these substances, there was also included the study of the changes which take place when farmyard manures are exposed to the leaching action of rain. The changes in the manures thus exposed involve not only a loss of a portion of the fertilizing material originally contained in the manure, but they also cause a

relative decrease in the availability of the portion still remaining. The soluble nitrogen, potash, and phosphoric acid are very readily washed out from the unprotected manure, and the resources of the farmer for replacing the plant-food taken out of his soil by the crops are thus very materially diminished."

Data for the composition of leached and unleached manure of various kinds and for comparative tests of the manure and other nitrogenous materials are reported as for previous experiments. The results show that the temperature and character of the season, as well as the length of exposure, are important factors in determining the loss from leaching of manure, the losses being greatest during periods of high temperature and abundant rainfall

"In all cases but one, the loss, both relative and absolute, was greater from the solid and liquid manure when taken together than it was from the solid manure alone. The absolute loss of phosphoric acid was about the same, although there was a relatively greater loss from the solid and liquid manure when taken together. The loss of nitrogen varied from 25 per cent to 46 per cent in the solid manure and from 39 to 69 per cent in the solid and liquid manure. The loss of potash varied from 10 per cent to 80 per cent in the solid manure and from 28 to 72 per cent in the solid and liquid manure."

Experiments were conducted on heavy loam soils with wheat followed by timothy and on light sandy loam with cabbage. The results with the wheat show that—

"On the whole, the fresh manures have returned greater amounts of nitrogen in the crop than was returned by the leached manures. This is in accord with previous experience, and shows the greater availability of the fresh manures. The nitrogen in ammonium sulphate made greater returns in the crop, when used either alone or together with solid leached, than was returned by the corresponding series where dried blood was used. The proportion of the nitrogen in the grain to that in the straw is, on the whole, rather constant. The fresh manures, where used alone, caused a more rank growth, and as a result there was more straw and more nitrogen in the straw in proportion to the grain on those series. . . . Through the long season the solid manure fresh was fully as efficacious as the solid and liquid fresh. . . . The solid fresh proved superior to the solid leached, and the solid and liquid fresh superior to the solid and liquid leached." Nitrogen in the form of nitrate gave a greater return than ammonium sulphate or dried blood. The results of the experiments with cabbage on the lighter soil in the main confirm those obtained with wheat.

The relative availability of the nitrogen in the various nitrogenous materials experimented with is summarized as follows:

Relative availability of nitrogen in different nitrogenous fertilizers.

Nitrate of soda	100
Sulphate of ammonia	94.8
Dried blood	94.7
Solid manure, fresh	36.3
Solid manure, leached	36.6
Solid and liquid, fresh	70.5
Solid and liquid, leached	48.1

"These figures show that the availability of the nitrate nitrogen is greater than that of the ammonia and of the organic nitrogen in dried blood. They show that the availability of the nitrogen in the solid and liquid fresh is greater than that in the other forms of manure. They show that the availability of the nitrogen in the solid and liquid manure leached is greater than that in either the solid fresh or the solid leached. They show that the avilability of the nitrogen in the ammonia or dried blood is greater than that of the nitrogen in any of the manures. These facts have been found to be so, with but few exceptions, in the other experiments."

Data relating to changes in the nitrogen content of sandy soils are reported and discussed in detail.

The duration of the effect of green manures, A. Petermann (*Bul. Inst. Chim. et Bact. Gembloux, 1903, No. 73, pp. 11–21; Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 4, pp. 504–514*).—Experiments with a number of crops grown on soil which had been in grass, the sod being turned under, and on soi which had been under clean culture, indicated that the effect of such green manuring is quite noticeable on early potatoes, less marked on late potatoes, still less marked the second year, and disappears the third. The use of lime to accelerate the action of green manures is suggested.

Fertilizer experiments on the sewage-irrigation fields of the town of Dortmund, Heppe and Gnirss (*Deut. Landw. Presse, 30* (*1903*), *No. 55, pp. 490, 491, fig. 1*).—Experiments are reported which show the importance of using potash and phosphoric acid in connection with sewage irrigation.

Some remarks on the object and method of conducting field experiments with fertilizers, F. W. Dafert (*Landw. Jahrb., 32* (*1903*), *No. 1, pp. 149–159*).—A reply to a criticism by T. Pfeiffer of the failure to include check plats in the plan of experiments carried out by the author, E. Meissl, and O. Reitmair (E. S. R., 12, p. 839). The general questions of the purpose, plan, and method of conducting field experiments are discussed.

The action of commercial fertilizers on sandy soils of different degrees of fertility, Bachmann (*Fühling's Landw. Ztg., 52* (*1903*), *No. 11, pp. 373–378*).—The results of 14 experiments with rye on sandy soils of different degrees of fertility show that on the average the yield of grain was doubled by the use of mixtures of Thomas slag, kainit, or 40 per cent potash salt, and nitrate of soda or sulphate of ammonia. The use of fertilizers was profitable in all cases.

Investigations on the value of the new 40 per cent potash fertilizer as compared with kainit, W. Schneidewind et al. (*Arb. Deut. Landw. Gesell., 1903, No. 81, pp. 168*).—The results of 3 years' comparative tests on a variety of crops are discussed in detail. Previous experiments have been referred to (E. S. R., 14, p. 852).

Conditions determining the poisonous action of chlorids, H. J. Wheeler and B. L. Hartwell (*Rhode Island Sta. Rpt. 1902, pp. 287–304, figs. 6*).—This question has been studied in a series of pot experiments begun in 1894. The experiments included tests of the effect of calcium chlorid on potatoes, and magnesium and ammonium chlorids on barley, rye, and oats.

"Calcium chlorid and ammonium chlorid were found to exert a marked poisonous action upon certain plants, when applied to a soil which was already somewhat acid. Magnesium chlorid was not found to be poisonous under conditions where great injury from calcium chlorid and ammonium chlorid resulted.

"Calcium carbonate and caustic magnesia used singly, also a mixture of basic slag meal with the carbonates of potash and magnesia, were found to prevent or overcome the ill effect produced by applications of either calcium chlorid or ammonium chlorid.

"There seems to be no good foundation for the caution about using sulphate of ammonia and muriate of potash or kainit in the same mixture on account of the formation of ammonium chlorid, provided the soil is duly tested with blue litmus paper, and lime, wood ashes, or other suitable substances are applied to correct or partially overcome the existing acidity.

"It is probable that all of the apparently conflicting evidence regarding the poisonous and nonpoisonous action of chlorids upon plants, when they are applied in reasonable quantities, could be explained without difficulty, had due attention been paid in all cases to the chemical reaction of the soil."

Field experiments with ammonium sulphate and sodium nitrate, Kloepfer (*Fühling's Landw. Ztg., 52* (*1903*), *Nos. 10, pp. 341–345; 11, pp. 388–393*).—The results obtained in field experiments were variable, depending apparently largely

upon conditions of soil, season, etc. The sulphate was slower in action than the nitrate, and for this reason it is recommended that it be applied earlier than nitrate.

Production, exportation, and consumption of nitrate of soda in 1902 (*Assoc. Sal. Propaganda Circ. Trimestral No. 30, 1903, pp. II, X–XXIV*).—The production is stated to have been 1,387,426.9 long tons, the exportation 1,399,508.8, the consumption 1,320,969.3. The nitrate was distributed as follows: Germany 490,210.2, United States 212,714.5, France 205,309.8, Belgium 144,831.2, Great Britain 109,790.2, Holland 96,225.6, Italy 30,381.4, Austria 8,012.5, Hawaii 5,964.3, other countries 17,777.8 long tons.

The utilization of the free nitrogen of the air in agriculture and industry, A. Frank (*Chem. Ztg., 27 (1903), No. 46, p. 543*).—Brief notes on the preparation and on tests of the fertilizing value of the so-called "lime nitrogen" (calcium cyanamid), a by-product of the manufacture of acetylene gas.

The new fertilizer law (*California Sta. Circ. [1903], pp. 6*).—This law, which went into effect July 1, 1903, requires the registration (with director of the State experiment station) and labeling of all fertilizing materials selling for $8 or more per ton. The labels must not only state the percentages but the sources of nitrogen, phosphoric acid (total and available), and potash. A registry fee of $50 and a tonnage tax of 25 cts. are required. The penalty for violation of the law is a fine of $50 and costs for the first offense and $100 and costs for each subsequent offense. The act also provides a sum of $1,800 for the equipment of a laboratory for the inspection work.

Fertilizers, F. T. Shutt (*Canada Expt. Farms Rpts. 1902, pp. 154–156*).—Analyses of 1 sample of squid, 1 of caplin, 3 of peat, and 5 of limestones are reported.

Report on official inspection of commercial fertilizers and agricultural chemicals during the season of 1902, C. A. Goessmann (*Massachusetts Sta. Rpt. 1902, pp. 9–21*).—The results of examinations of 451 samples representing 273 brands are summarized. Tables show the average composition of the different classes of all fertilizers analyzed, and the maximum, minimum, and average composition of special crop fertilizers. There was found to be wide variations in the composition of different brands of fertilizers recommended for the same crop. Thus in the tobacco fertilizers examined the nitrogen varied from 1.76 to 6.68 per cent, the total phosphoric acid from 3.38 to 13.71 per cent, the available phosphoric acid from 2.84 to 11.59 per cent, the potash from 1.54 to 14.15 per cent A schedule of trade values of fertilizing constituents and a list of licensed manufacturers and dealers are given.

Report on general work in the chemical laboratory, C. A. Goessmann (*Massachusetts Sta. Rpt. 1902, pp. 22–25*).—A brief note on the examination of wood ashes and miscellaneous material, including references to work on methods of soil and plant analysis.

Analyses and valuations of fertilizers, L. A. Voorhees et al. (*New Jersey Stas. Rpt. 1902, pp. 17–81*).—This is a reprint of Bulletin 163 of the station (E. S. R., 14, p. 749) with the addition of a list of manufacturers doing business in the State and data regarding market prices of fertilizers in New York during 3 years, 1899–1901, and a compilation showing the average composition of fertilizing materials examined by the station since its organization.

Fertilizers, C. V. Garola (*Engrais. Paris: J. B. Baillière & Son, 1903, pp. XI+502, figs. 33*).—This volume forms a part of the *Encyclopédie agricole* issued under the direction of G. Wery. It treats in simple manner of general principles of plant nutrition; calcareous amendments; farm manures and miscellaneous organic fertilizers; commercial sources of nitrogen, phosphoric acid, and potash; fertilizer laws, companies, and valuation; and practical methods of fertilizing cereals, hoed crops, leguminous plants, grass lands, oil-producing plants, gardens, and ornamental plants.

Recent progress in the fertilizer industry, R. von Grueber (*Chem. Ztg., 27 (1903), No 40, pp. 479–481*).—Reviews briefly general business progress and discusses raw products, methods of preparation, technical and scientific phases.

FIELD CROPS.

Annual Report of the Alaska Agricultural Experiment Stations for 1902. C. C. GEORGESON (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 233–307, pls. 11*).—The agricultural work of the stations for the year is summarized and discussed. Excessive rains very much interfered with the work.

Work at Sitka Station.—Excelsior winter rye seeded September 7 made a growth of $6\frac{1}{2}$ ft., and was sufficiently mature for harvesting by August 15. Its strong elastic straw enabled it to withstand storms and unfavorable weather for some time after complete maturity. While not as good as the Swedish winter rye, it is regarded as one of the varieties of value for Alaska. Carman wheat-rye, considered a hybrid between wheat and rye, largely winterkilled. The straw is strong and stands up well, and this character is the only one which might suggest that rye is one of the parent plants. Romanow spring wheat was grown on old and new ground. The crop lodged on the old ground, but was ripe enough to harvest by September 15, while on the new land it did not lodge badly, but did not begin to ripen until October 1.

The varieties of oats under test were Sixty-day, North Finnish Black, Burt Extra Early, Swedish Select, White Russian, and Improved Ligowa. Detailed notes on the behavior of each variety are given. All except Sixty-day were grown on new ground. Swedish Select suffered least from the unfavorable weather conditions. Sixty-day was sown May 8 and was ripe September 1. The earliness of this variety is considered its chief recommendation. Four varieties of barley were sown May 12 and 15. Manshury and Sisolsk were ripe September 15, and Black Hulless September 1. No difference was noticed in Lapland barley grown from imported and Sitka-grown seed. Riga flax was sown for fiber May 23. About three-fourths of the crop lodged, but the portion which stood up was of fine quality. About 5 per cent of the seed was ripe September 15. Common hemp sown May 23, on very poor soil, grew 5 ft. high and produced a fairly tough fiber.

The growth of furze and buckwheat and a number of grasses at the station is also noted. The grasses were sown May 14, and nearly all showed a good stand. The best growth was made by tall meadow oat grass, being about 2 ft. tall on August 1. Brief notes are also given on the growth of vegetables, nursery stock, and flowers. A concise report is presented on the construction of station buildings and the clearing and draining of station land.

Work at Kenai Station.—The progress of work at this station is reviewed and culture tests with vegetables and field crops are noted. The weather conditions were unfavorable. Nearly all the grasses grown made good stands, but produced only a light growth. Timothy and tall meadow oat grass reached a height of 27 and 30 in., respectively. Spring wheat did not ripen, and rye and winter wheat were winterkilled. Early Jersey Wakefield cabbage, Large Boston Market and Early Curled Simpson lettuce, and Extra Curled parsley, started in cold frames and transplanted, made a very satisfactory growth. Peas, beets, carrots, and parsnips were planted in the open ground May 13. Alaska and American Wonder peas gave good results, and Half-long Chantenay carrots and Hollow Crown parsnips did quite well, while Egyptian beets made but little growth. Rhubarb survived the winter and yielded abundantly this season. Specimens of White Dutch turnips weighing 8 lbs. and of Early Rose potatoes weighing 1 lb. were obtained.

Work at Rampart Station.—Romanow spring wheat, winter rye, Manshury barley and Black Finnish, Burt Extra Early, Flying Scotchman, and common oats grew to maturity.

In addition to the above reports the growth of different field, forage, and garden crops at Kadiak is briefly reviewed, and the opening of an experiment station in the Copper River Valley is described. The description of this station includes notes on its location and area, the topography of the region, the altitude, soil, and vegetation.

The results obtained with grasses and grains at the station and by parties living in that section are briefly given.

Seeds of field and garden crops were distributed in all parts of the territory, and the reports on this work are submitted. Tables are given showing the soil temperatures at the different stations for each day from May 1 to September, inclusive, and the meteorological observations made at the different points throughout the territory.

Annual Report of the Hawaii Agricultural Experiment Station for 1902, J. G. Smith (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 309–330, pls. 8*).—The improvements made at the station during the year are briefly mentioned. Experiments with taro indicate that the root rot of the crop may be prevented by proper liming and fertilizing of the soil and by planting slips which are free from the disease. A test was made of 45 varieties of potatoes to find a variety resistant to the black wilt disease. The seed potatoes were obtained from Maine. Only one variety, the June, was entirely resistant to the disease. Two varieties were partially resistant, while the rest were completely destroyed. The coffee industry is reviewed and the culture of different fiber plants, including sisal, malina (*Furcræa gigantea*) and olona (*Touchardia latifolia*) is described. An account of the occurrence and preparation of olona fiber is given.

Notes on the culture and growth of pineapples, figs, papayas, guavas, mangoes, alligator pears, grapes, limes, and peanuts are presented. The principal insect enemies of Hawaiian agriculture are enumerated, and the work of the station in dealing with this problem is outlined. Farmers' institute work in Hawaii is described and climatic conditions of the islands are noted.

Annual Report of the Porto Rico Agricultural Experiment Station for 1902, F. D. Gardner (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 331–357, pls. 8, fig. 1*).—This report contains an account of the present status of the station and a general review of the principal work for the year. The station farm, together with its equipment, is described. The propagation of coffee plants from seed was accomplished in seed beds protected by straw-covered sheds, and the young plants were transplanted to continue their growth in nursery beds. An experiment in improving old coffee groves has been begun and arrangements are being made to test different varieties on a 25-acre tract of new forest land.

Temporary field experiments were conducted at Rio Piedras with field, garden, and forage crops, and with flowering bulbs. The results are summarized in a table, and the growth of the most important crops is briefly noted. Insect and plant diseases attacked the garden crops, in some instances causing total destruction. A good stand of blue grass was obtained, but so far nothing further as to its value under Porto Rico conditions has been learned. Alfalfa gave some promise of success, and cotton produced abundantly, although the plants were small. Kafir corn and teosinte succeeded well. The problem of combating insect enemies is discussed. Special attention is given to the changa, or mole cricket, and statements regarding its classification and distribution are presented.

Attention is called to the soil conditions existing in the island, and the influence of fertilizers is shown by the results of an experiment with sweet potatoes. The average yield per acre from fertilized plats was at the rate of 14,478 lbs., or an increase of 8,758 lbs. over unfertilized plats. The largest yield was obtained where 188 lbs. each of acid phosphate and muriate of potash and no nitrogen had been applied. The soil upon which the experiments were made was found to be acid, and an application of 1,000 lbs. of lime per acre caused a noticeable improvement in the crop.

Notes on the growth and culture of tropical fruits, and the value of forest reservations on the island are given, and meteorological records for 1899 to 1902, inclusive, are shown in tables.

Culture work at the substations, 1899-1901, C. H. SHINN (*California Sta. Bul. 147, pp. 20–27, 36–41, 55–61, 83–88, figs. 5*).—This is a general summary of the field work of the California substations from 1899 to 1901, inclusive. (For the work in horticulture see p. 148.) The experiments with field crops consisted mainly of culture tests of a large number of different plants, including plants and seeds sent out by this Department for trial.

The Foothill Substation (at Jackson) (pp. 20–27).—A large range of cultures has been under test since 1899 and the more striking results are here noted. Australian saltbush did not show any decided advantage over other forage crops, but is considered worth growing on a small scale. Hairy vetch seemed better adapted to the region than the saltbush. *Atriplex leptocarpa* did not naturalize at all, while *Rhagodia spinescens inermis* furnished much fodder, but its adaptability has not yet been determined.

Bromus inermis has been thoroughly tested and is recommended for extensive culture. The grass was improved and its season lengthened by light irrigation. Evergreen and perennial rye grasses from England proved of great value when irrigated. Selected Perennial is regarded as one of the best. Sutton perennial red clover made a growth of 14 in. from March 1 to June 1, 1900. Common white clover, alsike clover, Egyptian clover (*Trifolium alexandrinum*), and snail clover (*T. turbinatum*) gave good results when irrigated.

Tests with root crops were carried on with and without irrigation on granite and slate soils. With irrigation beets, mangels, parsnips, and carrots gave large yields. Champion Yellow Globe mangel yielded 72.5 tons per acre, and of the 20 varieties grown none yielded less than 30 tons.

Notes on the growth at the station of Jersey kale, tagasaste, New Siberian golden millet, buckwheats, flax, and lupines are given. California, Royal, White Flowering, Belgian Improved, Russian Pskoff, Pure Riga, White Dutch, and Yellow Seeded flax produced excellent fiber and plump, bright seeds. The flax plants ranged in height from about 25 to 42 in. Among the varieties of lupines the Large European White proved most satisfactory. *Lupinus tricolor* and *L. angustifolius* were failures. The yields of the best vetches sent out by this Department are given in the following table:

Yields of vetches in 1900.

Name.	In full bloom.	Yield of green fodder per acre.
		Pounds.
Vicia peregrina	June 4	14,620
Vicia atropurpurea	...do....	17,240
Vicia fulgens	...do....	18,150
Vicia bythinica	June 5	19,057
Vicia narbonensis	May 25	25,400
Vicia sativa	June 4	25,410
Vicia sativa cordata	...do....	30,885
Vicia villosa	...do....	32,670

Lentils when early sown are considered well adapted to the red soils of the region. Turkestan alfalfa seemed hardier and more drought resistant, but did not yield better than the common varieties. Cuzco maize from Brazil and velvet beans did not succeed. Peruvian cotton did not mature, while Georgia upland varieties matured well and made a medium growth without irrigation on the red soils. The safflower (*Carthamus tinctorius*) was not equal to Russian sunflowers in the yield of seed for oil or chicken feed. March rape proved better than Essex, and sown on slate soil yielded 47 tons of green forage per acre. Rape had no value for summer pasture in that locality. Notes are also given on tests of horse beans, field peas, and artichokes. The hard wheats grown at this substation showed a tendency to increase their starch content.

Southern Coast Range Substation (*at Paso Robles*) (pp. 36–41).—Seventy-two perennial grasses were tested for their drought resistance, and the growth of the most promising species is briefly described. In 1899, 50 varieties of wheat, including 13 Algerian varieties and a number of cross-bred sorts, were under trial. All the Algerian wheats yielded above the average and ripened among the earliest. Some of the cross-bred sorts proved valuable. In a test of varieties of wheat for hay a cross between Frame New and Australian gave the heaviest yield and the best quality of hay. Notes are also given on the several varieties of wheat obtained from this Department. Cañaigre, Dwarf Essex, and March rape, *Bromus inermis*, safflower, foxtail furze, and Jersey kale made good growths at this substation; but Egyptian clover, vetches, Turkestan alfalfa, Russian millet, horse beans, lentils, goat rue, *Iris pabularia*, and *Lathyrus sylvestris* were not so generally promising. The rye grasses and clovers on trial were nearly all in need of irrigation. Giant rye grass (*Elymus condensatus*), in 1899, remained green without irrigation until autumn. The results with saltbushes at the substation have been previously noted (E. S. R., 14, p. 653).

San Joaquin Valley Substation (at Tulare) (pp. 55–61).—A large number of saltbushes have been under test at this substation and all withstood much drought and alkali. Those giving the best results, named in the order of their value, were *Atriplex semibaccata*, *A. pamparum*, and *Rhagodia spinescens inermis*. All varieties of alfalfa gave the best results with irrigation and withstood considerable alkali. Turkestan alfalfa grew more compact and produced more foliage than the common form. Species of *Lathyrus*, goat rue (*Galega officinalis*), horse beans, lentils, chick peas, and lupines have not generally given good results. Perennial rye grass, brome grass, Italian rye grass, and Texas blue grass (*Poa arachnifera*) were the best grasses under test. Most grasses and clovers needed some irrigation. The artichoke (*Cynara scolymus*) grew as well in strong alkali as the Australian saltbush. The growth of Tsama or Khama stock melon was much better than that of any other cucurbit, but the alkali in the soil reduced its yield.

Southern California Substation (*at Pomona*) (pp. 83–88).—Notes are given on the growth and value of a large number of field and garden crops. Turkestan alfalfa gave somewhat better results than the common varieties. The yields of carrots were very low, which result is attributed to the effect of alkali. Egyptian varieties of cotton rooted much deeper and outgrew the American varieties with which they were compared. No definite conclusion as to the value of Egyptian cotton culture in that region has been reached. *Bromus unioloides* made a much better growth than *B. inermis*. Soy beans were grown, and early and medium early varieties are recommended. The vetches tried were not a success. The Tsama or Khama stock melon yielded much better than the Kansas stock melon and showed its superiority in drought resistance.

Field experiments with farm crops, W. Saunders, J. H. Grisdale, W. T. Macoun, F. T. Shutt, J. Fletcher, R. Robertson, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1902, pp. 7–45, 81–89, 112–120, 156–160, 196–201, 232–249, 279–298, 319–339, 357–373*).—The results of the work with field crops at the Canada Experimental Farms in 1902 are reported and discussed. The average results of variety tests carried on in this connection at the different farms with most of the crops here mentioned have been noted from a previous bulletin (E. S. R., 14, p. 751). The data obtained in the variety tests at each of the farms are tabulated in detail, and include a larger number of varieties of the different crops than is given in the bulletin above mentioned. The report for 1901 is noted in E. S. R., 14, p. 130.

Wheat.—At the Central Experiment Farm at Ottawa 20 varieties of winter wheat were tested. The leading varieties were Dawson Golden Chaff, Imperial Amber, and Egyptian Amber, yielding 53¼, 46, and 45⅓ bu. per acre, respectively. American Bronze, the least productive variety, yielded 28⅔ bu. Spring wheat at Ottawa yielded best when sown at the rate of 1 bu. per acre on sandy loam and 2½ bu. per

acre on clay loam soil. Varieties of spring wheat grown from selected and unselected heads at the Manitoba farm gave practically the same average yields. At this same farm summer fallowing showed a great advantage over spring plowing for wheat. The yields from selected, well cleaned, and small seed at the farm for the Northwest Territories were $37\frac{1}{3}$, $32\frac{1}{3}$, and $29\frac{1}{3}$ bu. per acre, respectively. On fallow and new ground at this station fair yields were obtained, but on land which had produced root crops the year before the growth of straw was abnormal, and an attack of rust largely reduced the yield and quality. A culture test of winter wheat at this farm was a complete failure.

Oats.—At Ottawa the best yield on sandy loam was obtained by sowing $1\frac{1}{2}$ bu. of seed per acre and on clay loam by sowing $2\frac{1}{2}$ bu. At the experiment farm for the Northwest Territories, selected, well cleaned, and small oats for seed yielded $86\frac{7}{17}$, $80\frac{10}{17}$, and $72\frac{1}{17}$ bu. per acre, respectively.

Barley.—Different quantities of seed ranging from $1\frac{1}{2}$ to 4 bu. per acre were sown on sandy loam and clay loam soil at Ottawa. On the sandy loam the best yield was 45 bu. per acre, obtained from 4 bu. of seed, and the next best from the use of only $1\frac{1}{2}$ bu. On the clay loam soil 2 bu. of seed per acre gave the highest yield.

Spelt.—The yields of spelt sown on May 6, 13, 20, and 27 at the Manitoba farm were 59, 52, 56, and 61 bu. per acre, respectively. Sowing at the rate of $87\frac{1}{2}$ lbs. of seed per acre proved most profitable, the yield per acre being 54 bu. 40 lbs. At the station for the Northwest Territories a yield of 36 bu. 20 lbs. per acre was obtained and the crop required 108 days to mature.

Corn.—At Ottawa, Champion White Pearl, Selected Leaming, and Longfellow were sown in rows 21, 28, 35, and 42 in. apart. Champion White Pearl yielded best in rows 35 in. apart, and Selected Leaming and Longfellow in rows 28 in. apart. At the farm in the Maritime Provinces the yields of these same varieties were all in favor of 28 in. between rows. At the Manitoba farm where these varieties were grown in rows 24, 30, 36, and 42 in. apart the average yield of green corn per acre amounted to 15 tons and 1,328 lbs., and was in favor of the greatest distance. The yield at the farm for the Northwest Territories was in favor of 35 in. with Selected Leaming and Longfellow, and 42 in. with Champion White Pearl. At the British Columbia farm this same experiment was made but with the addition of plats planted in hills. The corn planted 6 in. apart in 21-in. rows gave the best yields in all cases, while the hill-planted crop of Champion White Pearl was in favor of 21 in., and that of the other 2 varieties in favor of 28 in. The highest average yield of green crop was obtained in drills.

Potatoes.—Experiments in planting at different dates have been conducted at Ottawa for several years. Plantings of an early and late variety were made at intervals of 2 weeks until late in the season. In 1902 the planting made May 15 gave the best results. The experiments, in general, have shown that a good crop of marketable potatoes can be obtained at Ottawa by planting as late as July 10. The best total average yield with the early as well as the late variety was obtained by planting during the last week of May. The average results of a 7-years' test of planting at different distances show that planting in rows $2\frac{1}{2}$ ft. apart, with the sets 14 in. apart in the row gave the best yields. For 6 consecutive years the largest yields were obtained in sandy loam soil from planting the sets 1 in. deep. For field culture the author recommends planting from 4 to 5 in. deep. While the largest yields have been obtained by planting large whole potatoes it is believed most economical to use medium to large tubers cut into sets having at least 3 eyes with a good amount of flesh. In a fertilizer test with superphosphate of lime at the British Columbia farm the yield per acre on the check plats was 355 bu. 18 lbs., while on the plats receiving 100, 150, and 200 lbs. of superphosphate of lime per acre the yields were 371 bu. 48 lbs., 391 bu. 36 lbs., and 409 bu. 12 lbs., respectively.

Soy beans and horse beans.—Soy beans were grown in rows 21, 28, and 35 in. apart. At Ottawa the plat with the rows 28 in. apart gave the highest yields of total green crop and of beans per acre, while at the farms in the Maritime Provinces and the Northwest Territories the yields of green crop were in favor of the 21 and 35 in. rows, respectively. Drills 28 in. apart gave the best results at the British Columbia farm but the yields for the other distances were nearly as great.

The same experiments were made on these farms with horse beans. At Ottawa the best total yield, 8 tons 160 lbs. per acre, was obtained from the rows 28 in. apart, while the 21-in. rows gave the best yield of beans, 37 bu. 20 lbs. per acre. At the farm in the Maritime Provinces the best yield was in favor of the 28 in. rows, while at the farm for the Northwest Territories the best yield was produced by the 28 and 35 in. rows, the yield being the same for both distances. A culture test at the Manitoba farm showed a growth of 36 in. in height and a yield of $10\frac{6}{10}$ tons per acre of green crop. Drills 28 in. apart gave the best yield at the British Columbia farm.

Flax.—Experiments at Ottawa to determine the best time for sowing and the quantity of seed required resulted in the best yield of straw, 6,440 lbs. per acre, from 80 lbs. of seed per acre sown May 21, and the heaviest yield of seed, 9 bu. 20 lbs. per acre, from the same quantity of seed sown April 30. Five different quantities of seed varying from 15 to 50 lbs. per acre were sown at the Manitoba farm, and the results showed that the yield of seed increased with the quantity of seed sown. Results on newly broken land were also in favor of the larger quantity of seed. In a test of several varieties made at this farm during the year, Novarossick yielded 22 bu. 28 lbs. of seed per acre, being nearly double the quantity yielded by any other variety. In the Northwest Territories sowing on May 17 gave better average results than sowing on May 26. Sixty lbs. of seed per acre yielded 16 bu. 16 lbs., as compared with 15 bu. for 80 lbs. of seed. Where 25 and 40 lbs. of seed had been used the yields were smaller.

Millets.—Among 9 varieties of millet tested at Ottawa, Algerian and Japanese led in productiveness, both varieties yielding over 17 tons of green crop per acre. The yields of hay per acre were 8 tons 800 lbs., and 8 tons 1,920 lbs., respectively. Italian or Indian millet at the farm for the Maritime Provinces gave a yield per acre of 13 tons of green substance, which was over 4 tons more than was obtained from any of the 4 other varieties grown. At the Manitoba farm 6 varieties were sown June 6 and cut September 4. The best yields were obtained from Algerian or Early Pearl and Italian or Indian. Algerian produced the largest stems and Italian the longest heads. Italian millet also produced the highest yield at the farm for the Northwest Territories. At the British Columbia farm Round White Extra French led in productiveness, followed by Algerian. The yields of all varieties at this station were small.

Buckwheat.—Of 5 varieties grown at the farm for the Maritime Provinces, Silver Hull, Rye, and Tartarian or Siberian were the most productive, the yields being 46 bu. 32 lbs., 45 bu. 40 lbs., and 41 bu. 32 lbs. per acre, respectively. In a field test 5 acres previously in buckwheat and fertilized, yielded 31 bu. 14 lbs. per acre, and 4½ acres of new land unfertilized produced 14 bu. 16 lbs. per acre.

Miscellaneous.—The conclusions drawn from fertilizer experiments in progress at Ottawa since 1888 are the same as previously noted (E. S. R., 14, p. 130). The effects of clover as a green manure for oats, corn, and potatoes for 1 and 2 years after the crop was plowed under are noted. In every instance during the 2 years the yields were markedly in favor of the green-manured plats. Experiments to determine the effect of superphosphate of lime and Thomas slag, used singly and in combination with kainit and nitrate of soda, on the yields of spring wheat, oats, and brome grass have been in progress since 1900 and are to be continued for a series of years. This year the best yield of spring wheat (both grain and straw) was with a mixture of 400 lbs. Thomas slag, 200 lbs. kainit, and 100 lbs. nitrate of soda per acre. In the

experiments with oats the check plats gave yields equal to those of the fertilized plats. The complete fertilizer application, containing superphosphate of lime, yielded the largest quantity of green crop of brome grass, but the check plat, producing over 1 ton of green crop less per acre, gave the highest yield of hay. In a test at the farm for the Maritime Provinces an application of muriate of potash gave better results than nitrate of soda and superphosphate, applied singly or in combination with the muriate. The results of special fertilizer experiments at this farm with barnyard manure and complete commercial fertilizers on different crops and crop mixtures are tabulated without comment. At the Manitoba farm, in a test with spring wheat, a mixture of 200 lbs. superphosphate, 100 lbs. nitrate of soda, and 100 lbs. muriate of potash per acre, one-half applied before sowing and the rest when the grain was 2 or 3 in. high, gave the highest yield of straw and grain—3,840 lbs. and 38 bu. per acre, respectively. In a test in the Northwest Territories the yield of wheat, and at the British Columbia farm the yield of oats, was also in favor of this combination and method of application.

The yields of different root crops and vegetables grown in various combinations at Ottawa are given in a table. Shallow cultivation and management of soils is discussed by the agriculturist of the Ottawa farm, and a series of crop rotations are recommended. The itemized cost of growing oats, mixed crops, hay, corn, mangels, turnips, sugar beets, and pumpkins is reported. The yields of hay obtained from different mixtures of grasses and clovers are shown and a number of important species of grasses are described. The best yield of hay this year was obtained from a mixture of meadow fescue 6 lbs., orchard grass 2 lbs., Kentucky blue grass 1 lb., common red clover 4 lbs., alfalfa 3 lbs., and white Dutch clover 1 lb. The first cutting, July 10, yielded 2.6 tons of hay, and the second cutting, August 30, 3.16 tons. Austrian brome grass compared with timothy and a mixture of alfalfa and brome grass at the Manitoba farm led in the yield of hay. The results for 3 years of a plan of crop rotation followed at the farm for the Northwest Territories are summarized. Brief notes are given on the growth of various forage crops at the different farms.

Cooperative experiments in agriculture, C. A. Zavitz (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 10–24*).—The average results of cooperative variety tests carried on by the Ontario Agricultural and Experimental Union in 1902 with oats, barley, wheat, buckwheat, peas, soy beans, corn, mangels, sugar beets, swedes, kohl-rabi, turnips, parsnips, carrots, millet, sorghum, vetch, rape, kale, clover, grasses, and other forage crops are reported in tables and briefly discussed.

The leading varieties were Oderbrucker oats, Oderbrucker Six-rowed barley, Black Hulless barley, Japanese buckwheat, Early Britain pea, Medium Green soy bean, Compton Early corn, Dawson Golden Chaff winter wheat, Evans Improved mangel, New Danish Improved sugar beet, Sutton Magnum Bonum swede, Greystone and Early White Vienna kohl-rabi, Bruce Mammoth Intermediate carrot, Improved Half Long parsnip, Wisconsin Earliest White Dent fodder corn, Japanese millet, Early Amber sorghum, hairy vetch, Dwarf Essex rape, Thousand Headed kale, Mammoth red clover, and tall oat grass. Alfalfa gave a larger crop than sainfoin and burnet.

In a cooperative test fertilizers were applied singly and in combination. Nitrate of soda and muriate of potash were each used at the rate of 160 lbs. per acre, and superphosphate at the rate of 320 lbs. The mixed fertilizer consisting of one part of nitrate of soda, one part of muriate of potash, and two parts of superphosphate was applied at the rate of 213.3 lbs. per acre. The average results for the number of years the work has been in progress show that the greatest yields were produced by the mixed fertilizer with oats, turnips, and corn for grain; by nitrate of soda with mangels, and by muriate of potash with corn for fodder. The fertilizer apparently exerted a greater influence on mangels and swedes than on either corn or oats.

Among 7 early varieties of potatoes, Rose of the North, as shown by the average results of 135 tests, led in productiveness, with a yield of 197.5 bu. per acre, followed by Early Dominion, Burpee Extra Early, and Stray Beauty. The average results in the yields of these 4 varieties did not vary 10 bu. per acre. In 1901 level culture produced 8.5 bu. and in 1902 4.8 bu. more per acre than hill culture. Potato sets sprinkled with land plaster gave an increase of 16.4 bu. per acre in 1900, 14.4 bu. in 1901, and of $\frac{1}{3}$ of a bu. in 1902 as compared with untreated sets.

Report of the agriculturists, W. P. Brooks and H. M. Thomson (*Massachusetts Sta. Rpt. 1902, pp. 102–153*).—The work here reported followed the general lines of the preceding years (E. S. R., 14, p. 133).

In the comparison of dried blood, sulphate of ammonia, barnyard manure, and nitrate of soda as sources of nitrogen for potatoes in 1902, the yields obtained ranked the different fertilizers in the order mentioned. The average results since 1890 with different crops place them as follows: Nitrate of soda, barnyard manure, sulphate of ammonia, and dried blood. Potatoes this year followed soy beans and the plats receiving no nitrogen produced a yield almost as large as the plats to which nitrogen had been applied yearly.

Sulphate of potash was superior to muriate of potash as a fertilizer for cabbage, mixed timothy and clover, and potatoes. A summary of the results for the series of years shows that the best yields of potatoes, clover, cabbage, and soy beans have been obtained with the sulphate, while the yields of corn, grasses, oats, barley, vetch, and sugar beets were about equal for the 2 salts. The sulphate produced potatoes and sugar beets distinctly better in quality than the muriate.

Nitrate of soda, dried blood, and sulphate of ammonia, used in connection with manure, ranked in the order mentioned as sources of nitrogen for garden crops. A comparison of sulphate and muriate of potash for this class of crops indicated that the sulphate was better for onions, tomatoes, and celery, while the muriate gave slightly better results with strawberries and squashes.

Among different potash salts used as fertilizers for clover, silicate, high-grade sulphate and nitrate of potash were most effective. The salts containing chlorin, especially kainit, proved injurious to the young clover.

The results with phosphates in quantities furnishing equal amounts of phosphoric acid as fertilizer for onions were in favor of dissolved bone meal, fine ground raw bone, phosphatic slag, and steamed bone meal, in the order given. Tennessee phosphate and Florida soft phosphate gave results very much inferior to all others.

Soil tests were continued this year with corn and potatoes. The results indicate that potash was the most prominent plant-food element controlling the yield of corn. The plat which had received 160 lbs. of muriate of potash per acre annually for 14 years yielded 47.7 bu. of shelled corn per acre, and the plat receiving 320 lbs. of dissolved boneblack per acre in addition to the muriate gave a crop of 55.9 bu. In the entire series of tests the plat receiving annually 5 cords of manure produced the highest yield of corn and stover. Four plats which had not been fertilized for 14 years showed a high degree of exhaustion. The crop of potatoes on lime soil was increased more by muriate of potash than by fertilizers furnishing either of the other plant-food elements. Nitrogen and phosphoric acid were more effective in increasing the yield of potatoes than the yield of corn.

Manure alone gave a larger yield of mixed grass and clover than manure applied with potash, but the increase was not sufficient to make it profitable. The preceding year corn was grown on these same plats with like results. A mixture of grass and clover was also grown with a special corn fertilizer as compared with an application richer in potash. The fertilizer mixture containing the greater quantity of potash produced 1,520 lbs. of hay more per acre than the special corn fertilizer which cost about $4 per acre more. The larger quantity of potash gave a greater relative abundance of clover.

As in the previous year, the results of fertilizing grass lands in rotation with wood ashes, nitrate of soda, ground bone, muriate of potash, and barnyard manure proved decidedly profitable.

The results in the experiment on the methods of applying barnyard manure were in favor of the spring application as compared with the fall application, but the difference in yield was not sufficient to pay for the extra handling.

The use of 150 to 250 lbs. per acre of nitrate of soda on timothy sod gave a profitable increase in the yield of rowen in every instance.

In a variety test of potatoes, Beauty of Hebron (first and second generations from Maine seed), IXL, Steuben, Early Nancy, Million Dollar, Ensign Bagley, Early Rose, Gem of Aroostook, and Daughter of Early Rose, in the order of productiveness, produced over 250 bu. of merchantable tubers per acre.

Report of the agriculturists, R. S. Shaw and F. B. Linfield (*Montana Sta. Rpt. 1902, pp. 21–56*).—Earlier results of the work described have been previously noted (E. S. R., 14, p. 26), and the data here reported include the average results for 1899, 1900, 1901, and the yields obtained in 1902.

The results of tests with 42 varieties of wheat are given in a table. The data include the yields of grain and straw, the weight per bushel, and the time required to mature. Onyx, Opal, Chili, and Russian 2955 led in productiveness and yielded 65.7, 65.2, 63.5, and 60.7 bu. per acre, respectively. The smallest yield obtained in the test was 36.6 bu. The macaroni wheats, Kubanka and Wild Goose, were grown under irrigation without any apparent softening of the kernel. Russian 2955 was obtained through this Department and has proved a most promising milling wheat.

Of 19 varieties of oats under test Swedish Select 2788, White Swedish, White Danish, American Banner, and American White yielded 100.3, 98.1, 91.8, 91.3, and 90.7 bu. per acre, respectively. The smallest yield in the test was 73.3 bu. Among 6 varieties introduced in 1901, Salzer Big Four led with a yield of 129 bu. per acre, followed by Irish Victor and Alaska with 126.3 and 104.6 bu., respectively. Swedish Select 2788 and Nameless Beauty were selected by the station for distribution throughout the State.

Seventeen varieties of barley under test for the same period have given average yields ranging from 43.2 to 71.4 bu. per acre. The leading varieties were: Goldenthorpe, New Zealand, Mandscheuri, and Highland Scotch, yielding 71.4, 69.9, 67.6, and 60.6 bu. per acre, respectively. Eight varieties of hulless barleys yielded from 33.8 to 56.8 bu. per acre. The Black Hulless, New White Hulless, Guy Male, and Delnoote yielded over 54 bu. per acre. The straw in the New White and Smooth Hulless barleys is considered superior to that of the Black Hulless for feeding purposes. A number of varieties of barley obtained from this Department and grown under extremely favorable conditions proved very promising. The yield of one of these varieties, Number 5473, was at the rate of 101.9 bu. per acre. Of the brewing barleys Chevalier, Goldenthorpe, New Zealand, and Mandscheuri have given the most satifactory results in field culture.

Of 43 varieties of potatoes grown in the 3 years, 23 gave average yields of over 400 bu. per acre. The leading varieties, Montana Beauty, White Elephant, Charles Downing, and Rural New Yorker No. 2, yielded 478.9, 475.8, and 470.8 bu. per acre, respectively. The statement is made that early varieties may be grown at an altitude of 6,500 feet, but that medium sorts are not a success when grown above 4,750 ft.

In 1902 the yields of wheat ranged from 29 to 77 bu. per acre, but there was only one yield below 50 bu. In oats the yields ranged from 90 to 174 bu., and with barley from 29 to 96.8 bu. per acre. The Pringle Champion wheat, Early Everett oats, and Guy Male barley were the leading varieties.

The cooperative work of the station with the farmers of the State is described, and the results of the same reported. In 1902, 86 farmers including 53 cooperators grew grain from station seed. The yields of cereals, hay, and root crops grown under irrigation are reported.

The results of a 6-year rotation experiment completed this season are given for the entire period. The rotation consisted of wheat, clover, barley, root crops, oats, and peas. No fertilizer was applied to any of the crops. The general conclusion was that the fertility of the land had been maintained. The rotation is, however, not considered practical and the work is to be continued in another form.

Report on field crops, J. H. SHEPPERD and A. M. TEN EYCK (*North Dakota Sta. Rpt. 1902, pp. 66–122*).—A general description is given of the work of the agricultural department for 1902, and the results obtained in the different experiments are presented in tables and discussed.

A review of the plant breeding work of the station shows that the nursery during the season contained the following number of individual plants: Wheat 10,800, oats 3,600, barley 3,200, buckwheat 1,525, flax 4,300, millet 2,300, and grass and alfalfa 2,002. During the season seed of improved grains and potatoes was sent to 119 farmers.

Notes are given on the growth at the station of red clover from various States and countries and of common Turkestan and Grimm alfalfa.

Forty-eight varieties of macaroni, fife and blue stem wheats were tested. In yielding capacity the macaroni varieties stood first. The average yields of the 3 best producing varieties of each class were 32.6, 26.8 and 23 bu. per acre for the macaroni, fife and blue stem varieties, respectively. The results for 9 years show that the blue stem varieties gave an average yield of 24.7 bu. and the fife varieties of 24.3 bu. per acre. In 1901 and 1902 the average yields per acre for the leading variety in each class was as follows: Yellow Gharnovka macaroni wheat 31.9 bu.; Selected Minnesota No. 285 fife 27.6 bu., and Haynes Pedigree blue stem 26.1 bu. Sowing on April 30 gave better results than sowing on later dates, but there was only a slight difference in the yields for April 30 and May 9 and 15.

Forty varieties of oats were tested, and the best yields were obtained from the earliest and the latest sorts. Sixty Day stood at the head of the list with a yield of 72.2 bu. per acre, followed by Selected Tartarian with 63.9 bu. This same variety also gave the largest average yield for the last 2 years. The data for all varieties is given in tables.

The results with barley for 9 years indicate Manshury six-rowed to be one of the best varieties. This season 19 varieties were grown, Houston Golden Queen leading in productiveness with a yield of 59.4 bu. per acre. For the past 2 seasons Mandscheuri, Manshury, Minnesota No. 87, Barnard, Minnesota No. 32, and Silver King, in the order given, have produced the best average yields. McEwan hulless has been the best producer in its class.

North Dakota emmer, a variety grown in the State for a number of years, has given better results than imported varieties.

In the experiments with flax selected Russian led with a yield of 25.9 bu. per acre, the heaviest yield on record at the station. Selected Riga produced long straw with few branches and little seed and an extra quality of fiber. The results of seeding experiments seemed to favor seeding less than 3 pecks per acre. The largest yield was obtained this season from the earliest sowing, which was made May 24, but nearly as large yields were obtained from sowings made June 17 and 23. The results of growing flax and wheat as a mixture showed an average yield of 14.3 bu. for wheat alone and 14.5 bu. of wheat and 3.9 bu. of flax for the mixture. The results of all trials apparently favor sowing at the rate of 3 to 4 pecks of wheat with 1.5 to 2 pecks of flax per acre.

The test with millet comprised 21 varieties, including Russian broom-corn millets and varieties under selection by the station. The object of the selection is the production of good crops of forage, and North Dakota No. 2 is proving excellent in that direction. In addition to the work with millets this season a trial of corn, millet, peas, oats, barley, and emmer, sown alone and in combination, was made to determine the comparative value for fodder.

Of 27 varieties of potatoes under test Rural New Yorker No. 1, Banner, Hammond Wonderful, Maule Commercial, May Netted Gem, and Tayler Best showed little or no scab, and Early Ohio, All the Year Around, Earliest Six Weeks, Quick Crop, and Early Minnesota ripened earliest. Early Harvest, Quick Crop, May Netted Gem, and Carman No. 1, mentioned in the order of their production, gave the greatest yields in 1902.

The yields for 1901 and 1902 of different root crops, including carrots, ruta-bagas, mangels, and sugar beets are shown in tables. Owing to its texture the station soil does not produce very large roots.

Eight varieties of beans were grown. White Wonderfield gave the largest total yield, Brown or Swedish the largest yield of marketable beans, and Dewey Navy was the earliest.

The growth of 44 varieties of corn during the season is shown in a table. The earliest varieties were French Squaw No. 32, Yellow and White Fodder No. 122, Gehu No. 123, Northwestern Dent No. 124, North Dakota No. 148, and Early Ripe Fodder No. 152. All of these varieties usually mature fully at the station. Mercer, Triumph, Longfellow, and King Philip, which ordinarily mature sufficiently to produce good corn, did not produce seed this season. The yield of corn planted on different dates in drills 6 and 42 in. apart was, for each date of planting, in favor of the 6-in. drills. The time of planting ranged from May 30 to June 23. The largest yield of fodder was produced by the earliest planting. In another experiment 12-in. drills gave the best yield of fodder, followed by planting in hills in rows 22 in. apart. Former results with planting in drills have indicated that for the production of ears the drills should be 36 or 42 in. distant. Experiments on the thickness of planting in drill rows with 1 kernel every 6 in. in the drill has given the best yield of fodder in 1902 and also the largest average yield for 3 seasons. Five stalks in a hill gave the largest yield of fodder for this season and 6 stalks in a hill the largest average yield for 3 trials. Cultivating corn deep and early, and shallow the last time proved best in 1902. Shallow cultivation throughout the season gave the second largest yield, and this method has also given the best average results for 3 years.

A soil moisture study was conducted during the winter and variations in the percentage of soil moisture during the season are given. During the 3 winter months fall plowed wheat stubble gained 2.68 in. of water in the first 3 ft. of soil, but lost 1.6 in. in the second 3 ft. Fall plowed wheat stubble harrowed immediately after plowing lost water in every foot of soil, but contained considerable more water than the soil in the preceding test at the beginning of the observations. Wheat stubble not plowed gained water in every foot, the total gain in 6 ft. amounting to 6.12 in., and brome grass sod lost water except in the first foot, the total loss amounting to 1.53 in. from the 6 ft. of soil.

The work with field and forage crops at the Edgeley Substation during the year is reported in brief notes. Brome grass made a very good growth and gave a yield of 400 lbs. of seed per acre.

Report of the work at the McNeill Branch Station for 1902, E. B. Ferris (*Mississippi Sta. Bul. 79, pp. 35, figs. 13*).—This bulletin contains a description of the station buildings and grounds, gives an account of how the land was cleared and improved, and reports the results of various fertilizer and culture experiments carried on during the year.

Wardwell Kidney Wax and Improved Valentine beans were grown on new soil which received a complete fertilizer application. The general financial results were in favor of an application of 27 lbs. cotton-seed meal, 13.05 lbs. dried blood, 60 lbs. acid phosphate, and 25 lbs. kainit per acre. The Improved Valentine variety yielded an average of 20 bu. more per acre than the Wardwell Kidney Wax bean, but was about a week later in ripening.

After the beans were removed the plats were planted with sweet potatoes about the middle of July. The yields on the different plats ranged from 140 to 164 bu. per acre.

The use of cotton-seed meal and acid phosphate for sugar cane gave yields varying from 22,140 lbs. to 24,711 lbs. of cane per acre, as compared with yields of 7,205 lbs. and 9,324 lbs. with no fertilizer.

Drought seriously interfered with corn experiments, but the results of a variety test show that under the conditions Mosby Prolific and Tatum Choice yielded the most grain. Mosby Prolific also headed the list in the production of stalks.

Fertilizer tests with cotton included 30 plats. The largest yield of seed cotton, 1,360 lbs. per acre, was obtained from an application of 300 lbs. per acre of each cotton-seed meal and acid phosphate. Among 14 varieties King Improved gave the highest yield, 1,159 lbs. of seed cotton per acre. This variety was followed by Peterkin with 950 lbs.

Culture tests with chufas, sweet potatoes, Spanish peanuts, sorghum, cowpeas, fall potatoes, and several orchard and garden crops are briefly noted.

General fertilizer experiments, G. C. WATSON (*Pennsylvania Sta. Rpt. 1902, pp. 191–267, pls. 7, dgm. 1*).—The results obtained from experiments with commercial fertilizers and barnyard manure, extending through a period of 20 years, are reported at some length. The experiments were designed to test the comparative effects of single fertilizer elements, complete and incomplete applications, and different forms and different quantities of nitrogen; to compare commercial fertilizers with barnyard manure, and lime and plaster with commercial fertilizers and barnyard manure; and to note the influence of lime, ground limestone, and plaster. The commercial fertilizers supplying the essential elements of plant food were dried blood, nitrate of soda, sulphate of ammonia, dissolved boneblack, and muriate of potash. The quantity of phosphoric acid and potash applied per acre every 2 years was in general 48 and 100 lbs., respectively, while the nitrogen was given in most instances in quantities of 24, 48, and 72 lbs. Barnyard manure was applied at the rate of 12,000, 16,000, and 20,000 lbs. per acre. Corn, oats, wheat, and clover and timothy were grown in rotation, and the fertilizers, save lime, which was applied to corn only, were applied to corn and wheat.

Corn.—In the test with the plant food elements used singly, phosphoric acid, potash, and nitrogen ranked in the order mentioned in the production of grain, while in the yield of stover potash stood first and phosphoric acid second. Where the 3 essential elements were given in combinations of 2, they ranked as follows: Potash and phosphoric acid, phosphoric acid and nitrogen, and potash and nitrogen, in the production of grain; and potash and phosphoric acid, potash and nitrogen, and phosphoric acid and nitrogen in the production of stover. Different amounts of dried blood in the complete application increased the yield of grain as the quantity of nitrogen increased, while rations of nitrate of soda under the same conditions had the opposite effect. The intermediate quantity of nitrogen (48 lbs.) in the form of sulphate of ammonia in the complete application gave the best results. The largest yields of grain were obtained when the quantity of nitrogen in the complete fertilizer varied inversely as its availability. The use of 12,000 lbs. of barnyard manure per acre gave better yields of grain than the use of a larger application, while a better yield of stover was secured from 20,000 lbs. than from a smaller quantity. The total yields were greater with barnyard manure alone than when the same was applied with lime. Ground limestone was more effective in increasing the yield of grain than the same quantity of lime, and land plaster was more effective in this respect than either lime or ground limestone. The application of 4,000 lbs. of lime per acre reduced the total yield as compared with the use of no fertilizer.

Oats.—Phosphoric acid, potash, and nitrogen used singly ranked in the order given in the production of grain and straw. The total yields on plats receiving nitrogen

and phosphoric acid, and phosphoric acid and potash, were almost equally good, while the plats receiving nitrogen and potash gave a smaller total yield and a decidedly smaller yield of grain. Dried blood was more effective than either nitrate of soda or sulphate of ammonia. The application of 48 lbs. of nitrogen per acre resulted in more grain than either a greater or smaller quantity. The yield of straw increased with the quantity of nitrogen applied. Of the different quantities of barnyard manure applied 16,000 lbs. per acre produced the best total yields. Lime used alone diminished the yield of grain but increased the yield of straw. Where 4,000 lbs. of lime was used in addition to 12,000 lbs. of barnyard manure the total yield and especially the yield of straw was increased as compared with the use of the manure alone. Ground limestone gave a decided increase in the yield of straw and a slight increase in the yield of grain. Land plaster was less effective than ground limestone.

Wheat.—The 3 essential elements applied singly ranked in effectiveness in the same order as in the test with oats. In total yield the application of the elements in combinations of 2 ranked as follows: Phosphoric acid and nitrogen, phosphoric acid and potash, and nitrogen and potash. Increasing the quantity of nitrogen increased the total yield. The largest and smallest applications of barnyard manure gave the largest and smallest total yields, respectively, on the manured plats. Lime and manure slightly increased the yield of grain over manure alone. Lime applied alone gave a small increase in total yield as compared with the unfertilized plats. Ground limestone was more effective than either lime or plaster. Of the 3 forms of nitrogen dried blood gave the largest yield of grain and sulphate of ammonia the largest yield of straw.

Timothy and clover.—Phosphoric acid, potash, and nitrogen applied singly ranked in effectiveness in the order given, and where the elements were applied in combinations of 2 the order was as follows: Phosphoric acid and potash, nitrogen and phosphoric acid, and nitrogen and potash. Where the nitrogen of the complete fertilizer was applied in the form of dried blood the largest yield was obtained from an application of 45 lbs. of this element, but where it was applied in the form of nitrate of soda or sulphate of ammonia the use of 24 lbs. gave the highest yield. Barnyard manure gave the best yield on the plat, receiving 16,000 lbs. per acre. An application of 4,000 lbs. of lime to supplement 12,000 lbs. of barnyard manure increased the yield. Lime alone compared with the plats receiving no fertilizers reduced the yield, while ground limestone and plaster each gave a slight increase.

Miscellaneous—Corn removed the largest quantity of nitrogen from the soil, followed by hay, wheat, and oats, in the order given. With respect to the quantity of phosphoric acid and potash removed, the crops stood in the following order: Corn, hay, oats, and wheat. In every instance more nitrogen was removed by the crops than was furnished in the fertilizer, and in every case but one more phosphoric acid was furnished than was removed. Potash, except where applied in the barnyard manure, was also given in excess of the quantity removed in the crops.

In these experiments a mean temperature for the growing season rather below than above the normal was found most favorable to the growth of corn and wheat, and one rather above than below the normal was best for oats and corn. Precipitation rather above than below the normal for the growing season gave the highest yields of corn, wheat, and grass, and when below rather than above the normal the largest yields of oats.

A five-year rotation of crops including clover, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Rpt. 1902, pp. 305–331*).—The results of an experiment conducted on 5 plats of exhausted soil for the purpose of demonstrating the value of rotation in the renovation of soils are reported at some length. The rotation was as follows: Indian corn on grass sod, potatoes, winter rye, clover, and grass. The 5 different plats introduced into the rotation successively showed the whole course of the rotation in any given year. The work has been in progress for over 5 years and

the rotation is consequently in its second course. Only commercial fertilizers are used in connection with this experiment. The history of each plat is given in detail. The smallest yield of shelled corn, 20.7 bu. per acre, was obtained in 1893, and the largest, 81.43 bu., in 1896. The third year 1.14 tons of corn stover per acre were produced and the fifth year 3.08 tons, being the smallest and largest yields respectively for the first course of the rotation. The minimum and maximum potato crop during the first 5 years was 125.2 and 253.3 bu. for the third and fourth years of the rotation, respectively. A general increase in the yield of potatoes as the rotation progressed was apparent. With rye the yields of grain tended to decrease and of straw to increase. The earlier grass crops were very small, but the use of lime on the land produced a marked improvement. In 1898 the yield of a plat having been limed 2 years before amounted to 4.56 tons per acre. In this rotation 120 lbs. of nitrate of soda per acre were employed as a top-dressing for the grass land, but the authors believe that for a yield of 4 tons per acre about 350 lbs. should have been used. In the second course of the rotation in 1902, after the land had been limed and the top-dressing of the nitrate of soda increased, the second year's hay crop amounted to 3.8 tons and the first year's clover and grass crop to 6.27 tons per acre. The results of different rotation experiments carried on by the station are considered to indicate that in renovating worn-out soils of this character it is probably better to begin the rotation with rye than with Indian corn or potatoes.

Broom corn, C. P. Hartley (*U. S. Dept. Agr., Farmers' Bul. 174, pp. 32, figs. 10*).—This bulletin gives a description of the broom corn plant with directions for the culture of the crop and its preparation for market. Broom-corn smut (*Sphacelotheca sorghi*) is described and a method for its control suggested. Notes are also given on the insect enemies of the plant and statistics of the crop are presented.

The book of corn, H. Myrick (*New York and Chicago: Orange Judd Co., 1903, pp. XVI+368, figs. 99*).—A popular treatise, noting the history of the corn plant, describing the different species, together with different strains and varieties, outlining the breeding and selection of seed corn, presenting rules for judging corn and discussing in general a wide range of subjects pertaining to the culture and uses of the crop.

Corn improvement for Missouri, G. M. Tucker (*Missouri Sta. Bul. 59, pp. 73-91, figs. 5*).—The possibilities of corn improvement are considered and the methods for the work outlined. The uniformity in size of kernel, the percentage of germination, and the number of barren stalks are given as factors influencing the stand. Directions for perfecting the stand are presented. The type of ear with reference to its length and circumstance, butts and tips, and space between the rows. and the type of kernel with reference to the uniformity on the ear and its shape are described. The suggestions for selection are summarized as follows:

"Begin with the whole field or breeding plat, from which select the best plants, according to performance. . . . From these best plants select by the eye and by measurements the best ears. . . . From these best ears select the best kernels. . . . From these best kernels select the few very best for the breeding plat and plant the whole field with the remainder."

Cotton ginning, D. C. Roper (*Twelfth Census United States, Census Bul. 2, pp. 46, maps 13*).—The quantity of cotton ginned from the crops of 1899–1902 is given by States and Territories and by counties together with other data pertaining to this branch of the cotton industry.

Grasses and forage plants in Idaho, L. F. Henderson (*Idaho Sta. Bul. 38, pp. 193-256, figs. 45*).—The grass plats at the station have been left undisturbed to determine how long the different species would sustain themselves. No cultivation was given but the weeds were cut out. A list of 80 species of grasses and leguminous plants which entered into this work is given. The entire list is considered in groups

showing the species well adapted to the Palouse country and those growing well in wet or moist meadows, on rich uplands, and on dry and sandy soil. The species of little or no value are also enumerated. The greater portion of the publication is devoted to the descriptions of the individual species considered. A list of forage plants growing spontaneously in Idaho, and which are known to furnish food to cattle and horses, concludes the bulletin.

Summer forage crops, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1902, pp. 63–68*).—The results of several trials with a mixture of winter wheat and vetch are reported, together with the composition of the green and dried fodder. The yields obtained in 1900 and 1902 were at the rate of 10 and 9.5 tons per acre respectively. The 1901 yield was estimated at 6 to 7 tons per acre. This season the land was seeded with Longfellow corn immediately after the removal of the mixed crop at the end of May. A yield of 17.68 tons of fairly well-eared green fodder per acre was obtained. The total yield of dry matter per acre for the season amounted to 8,622 lbs. The results of digestion trials reported in tables, lead to the conclusion that the mixture of winter wheat and vetch, fed green, is as digestible as either fodder corn or oat and pea fodder. The mixture when used as dry fodder, under normal conditions, is considered as digestible as when fed green.

Corn and soy beans were grown together and were successfully harvested with a corn harvester. Notes are given on the culture of soy beans and cowpeas and on the relative merits of several varieties of these crops.

Range improvement, J. W. BLANKINSHIP (*Montana Sta. Rpt. 1902, pp. 71–75*).—The necessity of range improvement in the State is discussed and the value of 3 species of grasses, *Agropyron spicatum*, *Bouteloua oligostachya*, and *Bulbilis dactyloides*, in connection with this work is pointed out.

The soy bean, G. E. ADAMS (*Rhode Island Sta. Bul. 92, pp. 119–127, figs. 3*).—This bulletin contains a popular account of the soy bean, its uses and culture. In the discussion the results of experiments obtained at the station and elsewhere are restated. For 10 years the Medium Early Green soy bean has produced good crops at the station and has never failed to ripen seed.

Report of the sugar-beet experiments in Ontario, 1902, R. HARCOURT (*Toronto: Ontario Dept. Agr., 1902, pp. 32, figs. 10, map 1*).—Sugar-beet experiments conducted on an extensive scale are described and the factories in operation in Ontario are enumerated. The value of sugar-beet pulp as a stock food is discussed and the composition of limestone rock from different points in the province is shown in a table. The results of culture experiments and fertilizer and distance tests here reported have been noted from another source (E. S. R., 15, p. 36).

The average weight, percentage of sugar, and coefficient of purity of beets harvested in September and October by the different experimenters are shown in tables. In general the later harvested samples were the best in quality.

Progress of the absorption of phosphoric acid by sugar beets, A. GRÉGOIRE (*Bul. Inst. Chim. et Bact. Gembloux, 1903, No. 73, pp. 22–31; L'Ing. Agr. Gembloux, 13 (1903), No. 10, pp. 425–437*).—In these studies it was found that the phosphoric acid content reached 0.78 per cent of the dry substance. The maximum absorption occurred between July 27 and August 24. The phosphoric acid was taken up most rapidly at the beginning of vegetation.

Quality of sweated tobacco produced by different fertilizer treatments, W. FREAR (*Pennsylvania Sta. Rpt. 1902, pp. 34–48*).—These experiments have been previously described (E. S. R., 11, p. 924). A detailed report is here given on the quality of the same crops of Havana leaf for the several years the work was carried on.

An application of cotton-seed meal, sulphate of potash, and dissolved boneblack gave a better yield of uniform and lighter-colored leaf than horse manure. The substitution of linseed meal for cotton-seed meal in this application apparently improved the flavor of the tobacco. The use of horn meal instead of cotton-seed meal and the

partial replacement of cotton-seed meal by nitrate of soda reduced both yield and quality. Sulphate of ammonia as a partial substitute for cotton-seed meal slightly improved the yield and the wrapper qualities of the leaf, but the flavor and the aroma suffered a marked deterioration. Where double carbonate of potash and magnesia was substituted for the sulphate of potash the leaf was more uniform and of better texture and a slightly improved burning quality, without impairing the flavor or aroma. The use of basic slag and the omission of a phosphate from the application resulted in a low yield of poor quality.

"Most commercial tobacco manures contain much of their nitrogen in the form of nitrate of soda or sulphate of ammonia. . . . Such manures are capable of improvement for . . . the Lancaster county limestone clays by reducing the . . . nitrate of soda and sulphate of ammonia to a very small fraction and increasing the quantity of concentrated nitrogenous vegetable material used as a source of nitrogen and humus."

Physical measurements of tobacco leaf from plats differently fertilized, W. Frear and J. A. Fries (*Pennsylvania Sta. Rpt. 1902, pp. 49–74*).—The results of a comparison of the wrapper leaves from the Havana tobacco grown in the course of the fertilizer experiments mentioned in the foregoing abstract are reported in tables and briefly discussed. It was observed that the physical characters of the leaf were much more influenced by the season than by the fertilizer application which in these experiments, in all cases except where horse manure was applied, furnished the same quantities of nitrogen, potash, and phosphoric acid. The variations in total yield and size and weight of single leaf were greatest in the best growing season, while the percentage of rib and the thickness and density of leaf were less subject to seasonal influences.

The use of horse manure resulted in a large and heavy leaf with thick rib and vein, but with low thickness of web and less density than the leaf from any other application. The tobacco grown with cotton-seed meal, sulphate of potash, and dissolved boneblack was smaller in size and weight, but thicker and of greater density of web. Where double carbonate of potash and magnesia were substituted for the sulphate of potash a good yield was obtained and the tobacco had a thin web, was generally of a larger size, and had a thinner vein than the tobacco on adjacent plats. The use of nitrate of soda in place of part of the cotton-seed meal reduced the size of the leaf with a considerable increase in density. Where sulphate of ammonia was substituted for the nitrate of soda the size and weight of the leaf were increased, and the thickness of the vein, but the web was thinner and the density lower.

Distribution of seed wheat, A. K. Risser (*Pennsylvania Sta. Rpt. 1902, pp. 268–270*).—A detailed report by counties is given of the results obtained in a cooperative test of Reliable wheat, a variety distributed by the station. Thirty-five replies were received from 24 counties. The yields reported ranged from 17 to 35 bu. per acre, with an average of 27 bu. The variety proved to be a good yielder, as compared with other sorts, but several experimenters objected to its weak straw and tendency to lodge.

Selection of wheat and corn, E. F. Ladd (*North Dakota Sta. Rpt. 1902, pp. 27–30*).—The selection of wheat was carried on at the station for the purpose of increasing the protein and gluten content. The results obtained during the last 3 years are given in a table without discussion. The corn selected for high nitrogen content in 1901 in nearly every case produced corn of a high nitrogen content in 1902. The physical method of selecting corn of a high nitrogen content was found quite reliable.

Analyses of grasses, flax, and wheat, F. W. Traphagen (*Montana Sta. Rpt. 1902, pp. 58–61, 66, 67*).—The results of analyses based on the air-dried and water-free substance of a list of grasses are tabulated. It is shown "that grasses of the same species, gathered at different periods at different stages of growth, may differ

in composition to a greater degree than grasses of totally different genera, collecte under similar conditions." Analyses of 5 species obtained from alkali districts ar also given. The composition of a sample of Montana-grown flaxseed is given, an its oil content compared with that of flaxseed in other countries. The change i composition of wheat grown from soft-wheat seed without irrigation is pointed ou and an analysis of Wild Goose wheat is reported.

HORTICULTURE.

Culture work at the substations, 1899–1901, C. H. Shinn (*California St Bul. 147, pp. 7–19, 28–35, 41–55, 62–82, figs. 9*).—An account is given of the climati conditions and of the work done at the Foothill, Southern Coast Range, San Joaqui Valley, and Southern California substations with orchard and small fruits, grape nuts, vegetables, and miscellaneous crops. (For the work with field crops see p. 134.

The Foothill Substation (*at Jackson*) (pp. 7–19).—Apples have not done well at thi substation. Pears have done fairly well on mixed granite and slate soil, and Japanes persimmons have been one of the most uniformly successful fruit crops at the sub station. Almonds, apricots, and nectarines have done well in the absence of lat spring frosts. Peaches are well adapted to much of the land about the substation and the most reliable general crop varieties appear to be, in the order of ripening Newhall, Newington Cling, Columbia, Salway, Beer Smock, Henrietta, and Wager The value of plums and prunes is as yet problematical. A number of varieties hav borne fruits, but yields have been low. Of the semitropical fruits grown the fig i the most promising. Olives also do exceptionally well. A good quality of Englis walnuts is grown, but the trees do not always bear heavily and the nuts are not large Nearly all small fruits do well at the substation, but currants need protection fro sunburn. Less water than is usually applied with more thorough cultivation i recommended for these fruits.

Southern Coast Range Substation (*at Paso Robles*) (pp. 28–35, 41–43).—Much of th work here reported with deciduous fruits has been previously noted (E. S. R., 14, p 252). A promising young apple orchard planted in 1897 is now coming into bearing One of the best varieties of apples appears to be Gold Ridge Winter. Notes ar included on the growth of a number of varieties of melons and squashes.

San Joaquin Valley Substation (*at Tulare*) (pp. 44–55).—Frost has killed or seriousl injured many of the semitropical fruits at this substation. Many olives have bee seriously injured. Among those which have proved most hardy are Macrocarpa Manzanillo, Mission, Oblonga, Pendulina, Redding Picholine, and Salonica. Mos species of Eucalyptus have done well at the substation. In the deciduous orchar alkali has been controlled by small applications of gypsum. A large number o varieties of apples have borne considerable quantities of fruit, but none kept beyon November 1. Pears have proved well adapted to alkali soils when not too strong and the success of a large number of varieties is reported. Almonds, apricots, an nectarines all gave poor results. Peaches do well at the substation, with the excep tion of Spanish and southern types. An amended list of the best varieties include among the clings Seller, Grover Cleveland, Chinese, and Oldmixon, and among th freestones Alexander, Oldmixon Free, Elberta, Lovell, Morris White, Muir, Ne Pickett Late, Salway, and Wheatland. Plums and prunes propagated on plum fail on the alkali soils of the substation orchard, but give better results on peac stock. Large crops of American and European sorts are sometimes secured varieties of figs also do well at the substation. One of the best varieties of grape from the standpoint of bearing is the Tinta Val de Peñas.

Southern California Substation (*at Pomona*) (pp. 62–82).—The account of the wor at this substation is prefaced by a brief history of it and an account of the clim and the amounts of irrigation water used for a large number of different crop

Deep-furrow irrigation is advocated for orchards, and a diagram is given showing low this should be carried out and the extent of percolation of irrigation water in lay, loam, and sandy soils from deep and shallow furrows. On sandy-loam soil it is tated that the irrigation furrows should not be more than 4 ft. apart, while on ighter soils 3 ft. apart is better. Apples have proved unsuited to the district. Six varieties appear to be absolutely blight proof. These are Early Ripe, Jonathan, Skinner Seedling, Smith Cider, Rhode Island, and White Astrachan. Pears do poorly. Of a large number of varieties of plums planted in 1891, only 14 varieties have proved worthy of retention. The best of these is Wickson. Almonds are of medium quality, but have borne only 2 good crops in 7 years. Cherries are a failure. Figs grow well at the substation but are practically a failure on account of "fig-sour." The most promising varieties of peaches are southern types. Some notes are given on the relative effects of frosts on a large number of olives. Oranges and lemons are reported as doing well. Notes are given on the relative yields of a number of varieties. Thick-skinned varieties have been least injured by frosts. The results secured with a large number of grapes grafted on different resistant stocks are tabulated.

Fruits, vegetables, flowers, and ornamental plants at the experimental farms in Canada, W. T. Macoun, W. S. Blair, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1902, pp. 91–110, 120–122, 124–128, 264–277, 303–306, 308–317, 339–349, 373–388, pls. 2*).—Reports in continuation of those previously noted (E. S. R., 14, p. 144) are given on the character, culture, and behavior under different climatic and soil conditions of a large number of fruits, vegetables, flowers, and ornamental plants grown at the experiment stations in Ottawa, Nova Scotia, Manitoba, Northwest Territories, and British Columbia. At the Central Station at Ottawa, W. T. Macoun reports an average profit for 4 years of $121.38 for Wealthy apples set 10 ft. apart in the orchard each way. Twelve new seedling apples of promise are described and 10 seedling plums given names. A list of the best spring flowering perennials is also given. S. A. Bedford describes several species of crabs and crab-apple seedlings that are most promising in Manitoba.

Horticultural department, R. W. Fisher (*Montana Sta. Rpt. 1902, pp. 88–95*).—An outline of the work of the horticultural department during the year with forest and ornamental trees, orchard trees, small fruits, and garden crops. A report on the hardiness of a number of deciduous and evergreen trees which have been grown at the station shows that the elm, oak, white birch, mountain ash, European larch, and the white and green ash are among the hardiest deciduous trees, while among the hardy evergreens are Colorado blue spruce, white fir, red cedar, mountain pine, Douglas spruce, and arbor vitæ.

Of the 64 varieties of apples set in the station orchard in 1895, only 26 are now alive, and of this number only about 8 are worth growing. These are Wealthy, Yellow Transparent, Duchess of Oldenberg, Okabena, Hibernal, Tetofsky, Longfield, and Gideon. Eight of the 10 varieties of crab apples set in 1895 are now alive, and of these the best are Whitney No. 20, Transcendent, Greenwood, Hyslop, and Orange. Out of 30 varieties of plums planted only 2, Moldavka and Yellow Veronesch, are recommended. Three out of 14 varieties of cherries set are now alive. These are Oklanka, Griotte du Nord, and Bessarabian. Flemish Beauty is the only pear which survived out of 16 varieties planted.

Raspberries have been successfully grown at the station when laid down and covered with dirt or straw in the fall for winter protection. Currants have proved one of the easiest crops to grow, being perfectly hardy. Variety tests are noted for string beans, beets, cabbage, and celery.

Report of the assistant in horticulture, A. T. Jordan (*New Jersey Stas. Rpt. 1902, pp. 245–290*).—The work of the station to determine the relative effects of different fertilizers, with and without irrigation, on the early and total yield of varieties

of asparagus, blackberries, raspberries, currants, gooseberries, strawberries, plums, cherries, pears, peaches, and apples has been continued (E. S. R., 14, p. 566), and in addition studies made to determine the value of growing peas, beans, and sweet corn in succession during the same year, and of double cropping with peas and tomatoes. The usual summary of weather conditions is included.

The average results of 5 years' work with asparagus show the Palmetto to be the heaviest yielding of 8 varieties under observation. It yielded 30 per cent heavier than Donald Elmira, which ranked second, and 42 per cent heavier than Conover Colossal, which ranked third. The total yield from the unirrigated plats on the whole has averaged about 3 per cent higher than on the irrigated plats. The top growth, however, averaged 4 per cent greater on the irrigated plats. The best yields have been on plats receiving complete fertilizers. An extra supply of nitrate of soda was not particularly advantageous in these experiments.

With blackberries, Eldorado has proved the most productive sort, for a period of 4 years, followed by Erie and Agawam. Arranging the results secured with irrigation for 4 years, the largest early yield has been obtained on the unirrigated plats, while the total yield has been about 3 per cent larger with irrigation. The use of nitrate of soda has resulted in increased yields on unirrigated plats, but where irrigation was practiced the yields were the lowest obtained. Irrigation has increased the early yield of raspberries 15.3 per cent and the total yield about 5.4 per cent. The use of an extra amount of nitrate of soda has not benefited this crop.

The most prolific currant tested was Red Dutch. The berries, however, are not so large nor do they find so ready a sale as Fay Prolific. A separate account has been kept of a number of individual currant bushes. These have been found to vary greatly in yield, and it is therefore suggested that in propagating currants cuttings be taken only from the most productive plants. The average increase in currants for 5 years, due to irrigation, has been 10.76 per cent, and in gooseberries 3.3 per cent. Both of these fruits have also yielded heavier when manured with 20 tons of barnyard manure per acre than when fertilized with 500 lbs. of complete fertilizer alone or combined with 150 lbs. nitrate of soda additional.

Six varieties of strawberries have been grown for 5 years. Bubach and Glen Mary have proved the heaviest yielding sorts. The use of 500 lbs. of complete fertilizer applied in the spring has resulted in larger yields than the same amount applied with 150 lbs. nitrate of soda additional. The average total yields for 5 years have been greatest on unirrigated plats.

The work of the station with orchard fruits is along the lines of variety testing, irrigation, and fertilizer experiments. Much of the data obtained thus far is reported merely as a matter of record. Plums, cherries, and pears have given on the average slightly increased yields on irrigated plats. Irrigation seemed to delay ripening in the case of the Lombard plum 6 days. On irrigated plats nitrate of soda appears to have been beneficial. Burbank has proved the most productive of several varieties of plums, and Champion the most productive of 6 varieties of peaches.

During the past 7 years the station has grown peas, beans, and sweet corn in succession, followed by crimson clover seeded in the sweet corn as early as possible in August. This rotation has been carried out on a number of plats each differently fertilized. Good crops of peas, beans, and sweet corn have been secured each year, but the crimson clover has not proved satisfactory, making but little growth in the fall and being plowed under too early in spring to make any growth. It is believed that rye would have proved a more satisfactory crop.

The heaviest yields of the different vegetables have been quite uniformly obtained from the plat fertilized with barnyard manure at the rate of 15 tons per acre. Commercial fertilizers in different proportions have resulted in poorer yields. The details of this work are fully tabulated. Doubling the number of rows and the quantity of fertilizer used has not resulted in a proportionate increase in yield. Peas and

tomatoes have been very successfully grown upon the same ground. Liming the soil has not resulted in increased average yields of these crops.

Report of the horticultural division, F. W. CARD and L. P. SPRAGUE (*Rhode Island Sta. Rpt. 1902, pp. 231–262, figs. 9*).—This report includes accounts of experimental work done with flowers, beans, sweet corn, sand cherry, and strawberries. In order to determine whether the red color of flowers may be intensified by feeding sugar to plants, as is asserted in a standard work on plant physiology, experiments were made in growing plants (1) with the addition of sugar to the soil, (2) with the addition of muriate of potash, and (3) with the addition of nitrate of soda. Practically speaking, none of these substances had any influence whatever on the color of the flowers. The work reported with beans is along the line of breeding experiments to develop varieties more resistant to frost and is in continuation of that previously noted (E. S. R., 13, p. 944). A number of detailed records of plants and their progeny subjected to cold are given, but so far no strain of beans has been developed hardier than the varieties commonly grown. The work is being continued.

In a test of the relative merits of board and slate for greenhouse benches as regards heat conduction, the data secured for a period of eighteen days are as follows: Average mean temperature of house, 60° F.; soil temperature of bench over slate, 61°; temperature underneath slate, 62°; temperature of soil over boards, 58°, and temperature underneath boards, 57°. Lettuce was grown in both benches. The average weight of the first crop was 4.13 oz. per plant from the slate bench and 3.85 oz. from the board bench. For the second crop these results were reversed, the average weight per plant being 4.82 oz. for the slate bench and 4.92 oz. for the board bench. It is believed, therefore, that under favorable conditions slate does not promise any great advantage over boards in affording bottom heat. A greater difference might be shown perhaps if all the heat were confined underneath the benches.

An experiment was made with corn to determine whether continued selection of the lowest ear on the stalk for seed would have any greater tendency to increase the number of ears per stalk than selecting the highest ear each time. The experiment was begun in 1899. The relative ear production in 1902 was as follows:

The effect of selecting the highest and lowest ears of corn for seed.

Seed selection.	Proportion of plants with—					
	No ears.	One ear.	Two ears.	Three ears.	Four ears.	Five ears.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
From lowest ear	21.32	48.17	27.72	2.72		
From upper ear	14.38	47.00	32.09	6.28	0.13	0.06

These figures seem to indicate that there is no greater tendency toward increased ear production by selecting the lowest ear for seed than selecting the highest ear. It is believed that the quickest way to increase ear production is to select the best developed seed from the plants producing the largest number of ears, regardless of the point on the stalk from which that seed comes.

The susceptibility of the sand cherry to fruit rot is pointed out as one of the reasons why this fruit is not likely to become useful in the moist climate of the East.

Experiments made to determine (1) the effect of muriate and sulphate of potash upon the firmness, color, and keeping qualities of strawberries, (2) the relative value of different forms of nitrogen for this fruit, and (3) the question whether phosphoric acid in the form of ground bone and floats can be applied to the field before planting strawberries in sufficient quantities and as effectively as annual applications of more readily available forms, are reported in considerable detail. The results of the 2 years' work, which are recorded, are conflicting. No material difference was noted

in the color or firmness of strawberries with the 2 forms of potash. The yield, however, was greater on the sulphate of potash plats.

"In the nitrogen tests sulphate of ammonia has proved best in all cases, with nitrate of soda second in 1901, and dried blood second in 1902. The yield from the plat with no nitrogen drops decidedly the first year, but is better than from the nitrate of soda plat the second year. . . .

"In regard to the third question, the indications so far as they go seem to show that it may be possible to add ground bone, at the time of planting, in sufficient quantities to furnish a supply of phosphoric acid during the fruiting period of the plantation, but that attempting to do the same thing with floats is not likely to prove so satisfactory."

A large number of crosses have been made between different well-known varieties of strawberries, including crosses between Wm. Belt and the wild strawberry. Descriptions of the seedlings and the fruit obtained are given, together with illustrations of the fruit.

Manuring of market-garden crops, B. DYER and F. W. E. SHRIVELL (*Jour. Roy. Hort. Soc.* [*London*], *27* (*1903*), *No. 4, pp. 995–1059, pls. 20.*)—The results of 7 years' work by the authors along the above lines have previously been noted (E. S. R., 14, p. 961). The present account gives the results secured in 1902 and summarizes the whole work for the preceding 8 years. The summaries correspond so closely to those of preceding years that they need not be again repeated. In general the work shows that a small amount of barnyard manure supplemented by commercial fertilizers is likely to be more economical and result in better yields than an excessive use of barnyard manure without commercial fertilizers, or from the use of commercial fertilizers alone without manure.

New experiences with beans, C. L. ALLEN (*Amer. Agr.*, *71* (*1903*), *pp. 476, 477*).—Seven varieties of garden beans were grown in 3 different localities to study methods of culture and find out the increase likely to be obtained from a given amount of seed. Light sandy soil mixed with coarser sand thrown out from a cellar and made fairly rich with stable manure was used in one instance. It was further enriched by 2 applications of 100 lbs. each of nitrate of soda. The soil of this plat was made as fine as possible with plow, harrow, and spade. The second plat was on light turfy loam in fairly good condition for ordinary farm crops. It was enriched in about the same manner as noted for the plat above. This plat was worked with plow and harrow only. The third plat was on low ground about 4 ft. from water. It was enriched with well-rotted stable manure and commercial fertilizers, costing at the rate of about $60 per acre. The soil of this plat was thoroughly pulverized with plow, harrow, spade, and rake. The beans in every case were planted singly 2 ft. apart each way. Shallow cultivation was given after rains, but great care was taken not to go deep enough to injure the roots. The average yield obtained was 168-fold on the first plat, 121-fold on the second plat, and 230-fold on the third plat.

The experiments are interpreted by the author to indicate that for the best results in bean culture the soil should have greater tilth before planting than is usually given, but the cultivator should never be used after the seed is sown except in rare cases, and that 3 qt. of seed per acre is ample. On heavy soils the plants should stand 1½ ft. apart each way.

Experiments in crossing plants, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1902, pp. 377–395, pls. 6*).—The report along this line is in continuation of that noted last year (E. S. R., 14, p. 568), with sweet corn, eggplants, tomatoes, salsify, Lima beans, cucumbers, and phloxes. The work for the most part has been with second generation hybrids, and the variations obtained have been exceedingly numerous. The attempt is now being made by further selection to fix the most desirable features of the strains selected. Further crosses in cucumbers were made between the Telegraph and Znaim varieties, and the hybrids obtained are illustrated.

A number of crosses between 24 commercial varieties of *Phlox drummondii* have been made and the different forms illustrated. A paper summing up the results thus far secured in the station breeding experiments (E. S. R., 13, p. 516) is included in the report.

Orchard studies. V. Report on crab apples, W. B. ALWOOD and H. L. PRICE (*Virginia Sta. Bul. 132, pp. 14, figs. 4*).—This bulletin describes 13 varieties of crab apples and gives critical notes on their culture and quality, based on 14 years' work with the fruits at the station. Crab apples will grow on poorer soil than apples, and are of considerable value in making preserves, jelly, and marmalades. They are also believed to deserve a place on the farm as ornamentals, since they bloom profusely and the fruits are very attractive.

Orchard studies. VI. Second report on the cherry orchard, W. B. ALWOOD and H. L. PRICE (*Virginia Sta. Bul. 133, pp. 19–28, figs. 4*).—Notes on the behavior at the station of 20 varieties of cherries. The following varieties are recommended: Coe, Early Purple, Mezel, Rockport, Schmidt, Windsor, Hortense, Olivet, Ostheim, and Montmorency.

The changing of the sex in plants (*Trop. Agr., 22 (1903), No. 11, pp. 789, 790*).—The possibility of changing the sex of the date palm and of the papaw is discussed. About 80 per cent of seedlings of date palms are male. The method of the Arabs in some of the oases in the southern part of Algeria in changing these male plants into bearing trees is to tear off all the leaves from the foot stalks, at 2 or 3 years of age, so that the medial nerve is split in two from the center to the leaf sheaf. It is believed that this tearing process brings about a concentration of the sap movement in the same way as is the case in annular incisions, resulting in an accumulation of sap, "which is more necessary for the vital functions of the female plant than for those of the male." The writer states that it has been his experience that cutting off the terminal buds of papaw trees (*Carica papaya*) as soon as the character of the flower is apparent results in altering that character, inducing the tree to yield good fruit in place of the poor specimens borne by the so-called male trees.

Small fruits in 1901, J. P. PILLSBURY (*Pennsylvania Sta. Rpt. 1902, pp. 415–443*).—The detailed records of variety tests with 62 kinds of strawberries, 31 of raspberries, 25 of blackberries, 8 of currants, and 11 of gooseberries are given, together with brief descriptions of the different varieties in some instances. During the season of 1901 the largest strawberries were produced in matted rows in case of 35 varieties and in hills in case of 22 varieties. The heaviest yields for a period of 5 years have been obtained from the matted rows, and of the varieties tested Crawford, Warfield, Henderson, and See No. 2 stand at the head. The heaviest yielding varieties grown in hills are Warfield, Henderson, Crawford, and See No. 5, in the order named. On an average the increase in yield from matted rows has been about 50 per cent greater than from the hills. The average yield of the Loganberry for 5 years has been 2,976 gm. per 12 plants. The 4 varieties of blackberries averaging highest in production are Eldorado, Snyder, Lovett Best, and Lawton.

Report on cooperative experiments with small fruits, H. L. HUTT (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 25–31*).—Each year the Experimental Union sends out a large number of plants to farmers in different parts of Ontario to be tested. This report contains an account of some of the results obtained up to the present time. The heaviest yielding strawberry in 1902 was Clyde; Van Deman was the earliest and Saunders the latest. Among raspberries, Shaffer has proved the heaviest yielder, while of the black sorts, Hilborn has been the most productive. Blackberries are reported much less hardy than raspberries. Snyder has proved one of the hardiest and, on the whole, given the best results. Victoria has given the best yields of currants tested, and Pearl and Downing lead in productiveness among the gooseberries.

Cranberry culture, L. C. CORBETT (*U. S. Dept. Agr., Farmers' Bul. 176, pp. 20, figs. 12*).—A popular bulletin on the details of cranberry culture in the United States.

Resistant vines and their hybrids, E. H. TWIGHT (*California Sta. Bul. 148, pp. 13, figs. 3*).—General information is given regarding resistant vines and their hybrids. The various species and hybrids are described and their value as stocks in California pointed out.

Effects of grafting; specific reciprocal influence of scion and stock in grapes, L. RAVAZ (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), Nos. 16, pp. 495–504, fig. 1; 17, pp. 514–520, figs. 2*).—This paper, which was read at the International Congress of Agriculture at Rome, in 1903, is also published as a separate. Experiments with a large number of species and varieties of grapes indicate that cuttings made from Vinifera grapes grafted on American stocks are no more resistant to phylloxera than cuttings grown on Vinifera stocks, and that the quality of the Vinifera fruit is not injured by grafting on American stocks for a period of years; neither is the quality of the fruit of American vines improved by grafting on improved varieties of Vinifera grapes. Notes are given on the modifications produced by grafting in the region of the callus, and on the influence of grafting on the nutrition of the vine.

"Headlight," a new early grape of the Delaware group, S. A. BEACH (*Amer. Gard., 24 (1903), No. 442, p. 365*).—The opinion of the author is given on a very early red grape originated by T. V. Munson in 1895. It has been grown at the Geneva Station for 2 years and the author believes it to be of sufficient promise to merit investigation as a very early grape.

Home manufacture and use of unfermented grape juice, G. C. HUSMANN (*U. S. Dept. Agr., Farmers' Bul. 175, pp. 15, figs. 8*).—Popular directions are given for the manufacture of unfermented grape juice in small and large quantities. A few recipes are given for a number of culinary uses of grape juice.

The pests and blights of the tea plant, G. WATT and H. H. MANN (*Calcutta: Supt. Govt. Printing, 1903, pp. 429, pls. 24, figs. 44*).—More than one-third of this book is devoted to tea culture, including such matter as races of the tea plant; seed gardens, and improvement of seed; hoeing, weeding, and tillage generally; drainage of tea gardens; principles of pruning; tea picking, and manuring; thus making the book a very complete treatise on tea culture. The chapters on the insect pests and the fungus diseases of the tea plant discuss these subjects very fully. Other animal pests, such as spiders, mites, nematodes, worms, snails, slugs, millipedes, etc., are also discussed.

Caoutchouc and gutta-percha cultivated in the Dutch East Indies, P. VAN ROMBURGH (*Les plantes a caoutchouc et a gutta-percha cultivées aux Indes Néerlandaises. Batavia, Java: G. Kolff & Co., 1903, pp. 208, pls. 15, map 1*).—This is a report of an exploring trip made with special reference to the caoutchouc and gutta-percha industries of the Dutch East Indies, more particularly the dissemination and culture of these trees. Various species of caoutchouc and gutta-percha cultivated in the Dutch East Indies are described, as are also the methods of producing these substances.

The culture of walnuts in France, J. ARTHAUD-BERTHET (*Ann. Inst. Nat. Agron., 2. ser., 2 (1903), No. 1, pp. 19–144, figs. 8*).—A treatise on walnut culture (*Juglans regia*) in France. The work discusses the botany of walnuts grown in France, classification of varieties, geographical distribution, climate best suited to this species, soils, methods of propagation, culture, manuring, harvesting, and the economic importance of the walnut industry in France, etc.

Shade trees and ornamental vines in Montana, J. W. BLANKINSHIP (*Montana Sta. Rpt. 1902, pp. 75–79*).—Notes on the most reliable and satisfactory shade trees that can be grown in different parts of Montana.

Budding the lilac, L. DANIEL (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 2, pp. 143–145*).—An account is given of some experiments in budding lilacs, in which conclusions are drawn for all grafts as follows: (1) The relative affinity or difference of functional capacities between stock and scion at different periods of the symbiosis plays a very important rôle in the success, duration, and biology of all grafts. (2)

Environment, weather, etc., particularly sudden changes of environment, has a considerable reaction on the whole, a reaction greater than in normal plants. (3) A number of irregularities, like diseases, etc., are the result of defective nutrition resulting from badly assorted grafts.

Flowers for the home garden, F. W. CARD (*Rhode Island Sta. Rpt. 1902, pp. 263–283, pl. 1, figs. 11*).—This is a plea for the home flower garden, with directions for the culture of such hardy plants as sweet peas, pansies, poppies, nasturtiums, phlox, calliopsis, zinnia, asters, cosmos, carrot, gladiolus, dahlias, and certain herbaceous perennials, like columbine and peony. The number of blooms obtained in 9 different sweet-pea mixtures is given. The results indicate that it is better to pay a fair price for a good quality of seed than to buy a cheap mixture.

Children's gardens, EVELYN CECIL (*London and New York: Macmillan Co., 1902, pp. XV+212, pl. 1, figs. 55*).—The kinds of flowers that can be successfully grown in England during each of the four seasons are briefly described, with notes and occasional hints as to methods of culture. The work, while ostensibly written for children, contains but few details, and at the same time is likely to confuse by treating of so large a portion of the plant kingdom.

Experiments with lawn grasses, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1902, pp. 395, 396*).—A table is given showing the species of lawn grasses seeded in a number of different plats at the station in the spring of 1896, and the condition and the stand of grasses, in percentages, during the past 7 years. Rhode Island bent, wood meadow, and Kentucky blue grass have proved most satisfactory, in the order named.

FORESTRY.

Forestry at the California stations, C. H. SHINN (*California Sta. Bul. 147, pp. 89–119, figs. 9*).—A progress report is given of the forestry work which has been carried on at the Santa Monica and Chico Forestry substations. These stations were established under the State Board of Forestry in 1887 and transferred to the University of California in 1893. Brief historical statements are given regarding the organization and equipment of the different stations, and data regarding the climate and rainfall are appended. The condition of the different species of trees is given, the principal information being supplemental to that included in previous reports.

At the Santa Monica Station, when taken charge of by the university, there were 44 species of eucalyptus growing, and this number has been extended to include more than 100 species, many of them represented by 50 or more growing specimens. The rate of growth of these different species, their adaptability to their conditions, and value for various purposes are shown. The same factors for acacias, oaks, and other hard-wood trees are given. Among the various plantings undertaken an experiment was carried on to test the drought resistance of different species. All the observations seem to show that some of the tan-bark acacias are among the most drought-resistant trees, and with fairly good cultivation *Acacia decurrens* and *A. mollissima* can be established without any irrigation where there is an annual rainfall of only 10 in.

At the Chico Station the most striking features consist of the large pines, cypresses, sequoias, and other conifers planted in blocks. The size and rate of growth of representatives of these different groups are given. The experience obtained at this substation shows that for general planting in the Sacramento Valley and foothills the yellow pine of the Sierras, redwood, big tree, Monterey pine, and Oregon pine are the best. Among the exotic conifers tested the Deodar cedar and Austrian pine have given the best results.

An account is also given of tree planting on a hilltop at Berkeley. This planting was begun in 1887, and the tract planted comprises about 250 acres and rises to an elevation of 950 ft. This has been planted at various times to eucalyptus, acacias, oaks, Monterey pine, etc. All the trees have been subject to pasture conditions and

have received little or no care. The growth of the different species is shown, from which it appears that *Acacia decurrens*, several species of eucalyptus, and oaks are well established. Land as steep as this tract rents at from 50 cts. to $1 per acre, and is used only for pasturage. From the rate of growth shown in this experiment it would be a much better investment to plant to forest trees for firewood and timber.

Forest conditions in the Northern Sierra Nevada, California, J. B. LEIBERG (*U. S. Geol. Survey, Professional Paper No. 8, pp. 194, pls. 12*).—The region covered by this report is situated in the north-central portion of California and embraces an area of 3,491,100 square miles. Its topography and general characteristics are described, after which a detailed description is given of the forest area. The principal species of trees are enumerated and the range of each indicated. The forest is considered as being represented by different types, each of which is described in detail. The extent of timber cutting, effect of forest fires, grazing, and results of deforestation, as far as the restocking of the burned areas has been observed, are all described.

The forests of Oregon, H. GANNETT (*U. S. Geol. Survey, Professional Paper No. 4, pp. 36, pls. 7*).—A general review is given of the forests of Oregon, being based upon details furnished by special agents of the Geological Survey and from other sources. According to the report the wooded area of Oregon amounts to over 40,000 square miles, about 28,800 of which are covered with merchantable timber. The effect of forest fires in this region is shown, and it is stated that the burned area comprises more than 7 per cent of the entire State, the loss of timber alone, at the present stumpage value, being over $54,000,000. The present total stand of timber is estimated at 213,398,000 M feet B. M. Over 80 per cent of this stand is found west of the crest of the Cascade Mountains. In this region the average stand of timber is not less than 17,700 ft. per acre. The dominant species of timber are red fir, which comprises about 66 per cent of the total; yellow pine, 17 per cent; Sitka spruce and hemlock 5 per cent each, followed by red cedar 2 per cent, and a number of other species comprise 1 per cent or less. A classification is given of the land, and stand of timber by counties, and the total stand is shown in a tabular form.

Forest conditions in the Cascade Range Forest Reserve, Oregon, H. D. LANGILLE, F. G. PLUMMER, ET AL (*U. S. Geol. Survey, Professional Paper No. 9, pp. 298, pls. 41*).—This publication gives a detailed report on different portions of the Cascade Range Forest Reserve, and includes an introduction by H. Gannett, in which the boundaries of the reserve are described and a synopsis given of the general observations made by the special agent. The total area of the reserve is said to be 4,883,588 acres, of which fully 85 per cent is forested. Of the remainder, 8 per cent has been swept by fire, and the balance consists of open country, barren rocky areas, which extend above timber line, and water surface. The stand of timber in this reserve exceeds 50,000,000,000 feet B. M. and is principally represented by red fir, noble fir, hemlock, and yellow pine, a number of other species making up the remainder of the timber. The different portions of the forest range are described, classifications being given of the timbered, burned, cultivated, cut-over, and other areas.

Forest conditions in the Cascade Range, Washington, F. G. PLUMMER (*U. S. Geol. Survey, Professional Paper No. 6, pp. 42, pls. 11*).—A report is given of the forest conditions observed by the author in the Cascade Range, Washington, between the Washington and Mt. Rainier forest reserves. The area covered amounts to about 2,800,000 acres, of which 2,500,000 is naturally timbered, but which has lost 8.4 per cent by fires and 1.64 per cent by logging, thus leaving 2,292,870 acres of timber land, upon which 12,001,510 M feet B. M. is left standing. Lists are given of the principal timber species and their distribution, together with a number of associated species, many of which are not considered of economic value. Attention is called to some of the defects and diseases of timber trees, but in general the timber of this area is free from any serious defects. The effect of grazing on the forests is briefly

indicated and attention called to the fact that in some regions the range is heavily overstocked. Notes are given on the irrigated lands embraced within this area and estimates made regarding the possible extension of irrigation to other parts of this region.

Forest conditions in the Olympic Forest Reserve, Washington, A. DODWELL and T. F. RIXON (*U. S. Geol. Survey, Professional Paper No. 7, pp. 110, pls. 20*).—A general description is given of the location, boundaries, topography, and character of the lands embraced in the Olympic Forest Reserve, which comprises 1,939,000 acres. Taken as a whole, this is said to be the most heavily forested region of the State, and with few exceptions the most heavily forested portion of the country. The timber in this reserve amounts to 60,998,250 M feet B. M., an average stand of about 33,000 feet B. M. per acre. Of the area examined, 83 per cent is covered with merchantable timber, 5 per cent has been burned over, about 0.5 per cent has been logged, while almost 12 per cent is timberless. The species of this region are described, together with the associated trees and shrubs, and a detailed description is given of the different townships embraced within the reserve.

The forests of Washington, H. GANNETT (*U. S. Geol. Survey, Professional Paper No. 5, pp. 38, pl. 1*).—This bulletin is a revision of estimates previously made on the stand of timber in Washington forests. With the exception of the redwood forests of California, the forests of western Washington are the heaviest and most continuous in the United States. The timber is mainly red fir, mingled with spruce, hemlock, and cedar. In giving the revised estimates the author has raised the estimated total stand from 114,778,000 M feet B. M. to over 195,687,966 M feet B. M. The stand of timber in the different counties of the State is indicated and a classification given of the lands of the different counties, comparisons being made between the areas of merchantable timber, timberless areas, and those which have been cut over.

Experiments in tree planting on Sable Island, W. SAUNDERS (*Canada Expt. Farms Rpts. 1902, pp. 55–58*).—In continuation of the previous report (E. S. R., 14, p. 152), an account is given of the condition of trees and shrubs which were planted on Sable Island, off the coast of Nova Scotia, in 1901. Many of the plants were winter-killed, but the survivors made fairly satisfactory growth during the summer. A prolonged drought accompanied by high winds injured many, but on the whole the planting has proved of practical value. A list is given of the varieties of trees and shrubs which have survived the winter and summer conditions.

Forest belts, W. T. MACOUN (*Canada Expt. Farms Rpts. 1902, pp. 122–124*).—A brief account is given on the condition of the various forest belts at Ottawa, which have been previously reported upon (E. S. R., 14, p. 152). During the season covered by the report the trees made favorable growth, and on account of the dense leaf canopy considerable thinning was necessary. The condition of a number of species of trees and shrubs in the arboretum and botanic garden is noted, and it is pointed out that out of 121 trees native in Ottawa more than 100 have proved hardy at this station.

Notes on trees and shrubs, S. A. BEDFORD (*Canada Expt. Farms Rpts. 1902, pp. 306–308*).—The condition of trees and shrubs in the arboretum at the experimental farm in Manitoba is reported upon, from which it appears that most of the species made fairly good growth during the season of 1902. Plantings were made of oak and spruce and the young trees appear to be well established. More than 110,000 trees were distributed during the season and the results so far as reported upon have been entirely satisfactory.

Notes on trees and shrubs, A. MACKAY (*Canada Expt. Farms Rpts. 1902, pp. 345, 346*).—The condition of the trees and shrubs at the Northwest Territories Experimental Farm at Indian Head is reported upon, from which it appears that nearly all the specimens passed the winter without serious injury. Many of the shrubs fruited for the first time and the seed was collected for distribution. As

reported previously, the maple seed was again practically destroyed by a fungus so that seed for distribution had to be obtained from a different locality. Evergreen trees, particularly white and Rocky Mountain spruce and Scotch and mountain pine, made good growth during the season. A list is appended of trees and shrubs that have proved conspicuously successful for the region covered by the report.

Experimental foresty (*Rpt. Govt. Forest Adminstr., 1893–1902; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 2, pp. 241, 242*).—A brief survey of the activity of the Russian forestry administration for this period.

A primer of forestry, G. PINCHOT (*U. S. Dept. Agr., Farmers' Bul. 173, pp. 47, figs. 33*).—This bulletin is a popularization of a former publication of the Division of Forestry (E. S. R., 11, p. 855). The text has been revised to some extent and many new illustrations provided. It is believed that the new bulletin will prove more useful for general distribution than the previous publication.

SEEDS—WEEDS.

The influence of sterilized soil on seed germination, G. E. STONE and R. E. SMITH (*Massachusetts Sta. Rpt. 1902, pp. 40–42*).—The authors have observed for some time in their study on the influence of sterilized soil on various plant diseases that the seedlings and subsequent growth of plants germinated in sterilized soil were more vigorous than those in soil not so treated. In the present report they give a brief account of experiments to determine the effect of sterilization of the soil on the germination of seed. Old seed of low germinating capacity were selected for the purpose of the investigation, and results of the tests with radish, tomato, cucumber, lettuce, onion, mustard, turnip, and clover seed are given. Two hundred seeds of each kind were used in each experiment, in some instances the experiment being repeated 3 times. While the results can not be considered as conclusive, the preliminary experiment indicates that the germination of lettuce, cucumber, melons, tobacco, etc., is favored in sterilized soil.

Experiments in the germination of corn, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1902, pp. 409–412, pl. 1*).—The results of a number of experiments on the germination of corn are given in which an attempt was made to determine some of the factors which might contribute to the production of albino or white seedlings. The seed was germinated in the presence of as little moisture as possible, and was taken from large and small ears for comparison, from different rows in the ear, from different parts of the ear, from stalks which bore more than 1 ear, and from grains produced by close and cross pollination. The germination tests did not give sufficiently marked differences to warrant any conclusion, but it was determined that there was apparently some relation between close fertilization and the production of albino seedlings, the albinos being most abundant in seedlings grown from ears of corn which had been close fertilized.

On the behavior of mutilated seedlings, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1902, pp. 412–414, pl. 1*).—This is an abstract of a paper presented before the Society for Plant Morphology and Physiology January 1, 1902, and subsequently published (E. S. R., 14, p. 11).

Tests of the vitality of seeds, 1901–2, W. T. ELLIS (*Canada Expt. Farms Rpts. 1902, pp. 45, 46*).—A report is given of tests of 1,830 samples of seed grain and other seeds which were tested during the season of 1901–2. More than 95 per cent of all the samples were wheat, barley, oats, and peas. A tabular statement is given showing the relative value of the different lots, and additional tables are given in which results of seed tests carried on in different provinces are shown.

Seed testing, J. S. REMINGTON (*Reprint from Jour. Roy. Lancashire Agr. Soc. 1903, pp. 8*).—A discussion is given of the methods of seed testing, together with results of some investigations, and a table which shows the purity, germination, and actual

value of samples of a large number of varieties of field and garden seeds, as well as those of a number of forage plants.

Seed testing of alfalfa and medic, D. FINLAYSON (*Aynsome Agr. Sta., George-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 3, pp. 8, pl. 1*).—Illustrated notes are given on some of the impurities found in alfalfa and medic seed, and results of tests for purity and germinative ability of these seeds.

Impurities in farm seeds, G. H. CLARK (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 47–49*).—A discussion of some of the impurities found in farm seeds, particular attention being given to those occurring in the seeds of cereal crops and forage plants. Under the conditions described most of the weed seeds are found in oats, and many of the more troublesome weeds have been distributed with seed oats. Many weed seeds are distributed in timothy, alsike, and red-clover seed, and a table shows the results of a large number of investigations of these seeds and the principal weed seeds found in the samples.

Notes on weeds, J. W. BLANKINSHIP (*Montana Sta. Rpt. 1902, pp. 70, 71*).—Brief notes are given on the occurrence and distribution of the alfalfa dodders (*Cuscuta epithymum* and *C. arvensis*), a native Coreopsis, and the common dandelion. All of these weeds are said to be very troublesome under Montana conditions, and suggestions are given for their repression and warning against their introduction through the use of impure seeds.

Weed notes, B. D. HALSTED and J. A. KELSEY (*New Jersey Stas. Rpt. 1902, pp. 396, 397*).—In continuation of the previous investigations on weeds (E. S. R., 14, p. 578), the authors report on the relative prominence of different species of weeds in a plat of ground which has been abandoned to weed growth for 6 years. The most numerous species in order of individuals are *Rumex acetosella*, *Daucus carota*, *Bromus racemosus*, *Polygonum pennsylvanicum*, *Abutilon abutilon*, and *Chrysanthemum leucanthemum*. A number of other weeds have made their appearance, and at present the weed plat contains about 30 species of plants. Brief notes are given on the occurrence of horse nettle, corn chamomile, ground ivy, and ailanthus, and suggestions for their eradication.

The broom rapes, H. GARMAN (*Kentucky Sta. Bul. 105, pp. 32, pls. 6, figs. 9*).—This bulletin is in continuation of a previous one (E. S. R., 2, p. 22). For 10 years or more the author has been observing broom rapes, and of the 16 species enumerated three (*Orobanche ludoviciana*, *O. minor*, and *O. ramosa*) are known to occur in Kentucky. Branched broom rape (*O. ramosa*) is the best-known species and thus far has not been observed outside the blue-grass region. This species, which is parasitic on hemp, tobacco, tomato, potato, rape, cabbage, and other plants, is described at considerable length, its habits of germination, growth, and parasitism being given in detail. A number of enemies have been noted, among them being several species of aphis, some of which are still under observation. The seed of broom rape are mostly disseminated through sowing with hemp and other seed. The plants may be removed from growing tobacco and seed hemp so as to prevent seeding and further spread. Seeds of broom rape are known to retain their vitality for at least 13 years while lying in the soil. Soaking the seed with strong solutions of copper sulphate kills the broom rape without seriously injuring the hemp seed. Treating with water heated to 140° F. also destroys the broom-rape seed without exerting any hurtful effect on the hemp. The application of gas lime and copperas did not prevent the growth of broom rape, but copper sulphate in the proportion of 1 ton to the acre checked the parasitic growth. This has been considered too costly for field work. Common salt used in the proportion of 2 tons to the acre destroyed both the hemp and broom rape. On this account it can not be used on growing hemp, but if the ground has become badly infested it could be used and after the destruction of the weed some other plant may be cultivated until the injurious effect of the salt disappears.

DISEASES OF PLANTS.

Report of the botanists, G. E. STONE and R. E. SMITH (*Massachusetts Sta. Rpt. 1902, pp. 27–38*).—A review is given of the plant diseases under observation during the season of 1902 and discussions given of some of the more important ones. Among the diseases more extensively described are the cucumber mildew (*Plasmopara cubensis*), muskmelon blight, apple leaf spot due to frost injury, a strawberry disease, plum yellows, etc.

The cucumber mildew, which was first reported at the Massachusetts Station in 1889, has since become very prevalent throughout the Southern and Middle States, and since 1900 has reappeared in Massachusetts, being found on greenhouse cucumbers in different localities. Experiments in spraying for the prevention of this disease have shown but little gain attributed to the use of fungicides. When occurring in fields the fungus does not seem to seriously diminish the yield, but when appearing upon greenhouse cucumbers great damage may be occasioned. The disease is more prevalent upon the early started plants, and on this account the authors recommend starting the plants in October and keeping the atmosphere of the house in as dry condition as possible. By the removal of the affected leaves the disease may be kept in check and where an early crop has been planted spraying with Bordeaux mixture is recommended.

The chief injury to muskmelons reported was from the downy mildew which occurred in connection with the anthracnose and an Alternaria disease. On account of the serious outbreak of the mildew the growing of muskmelons has been almost a complete failure. An experiment has been conducted in cooperation with local growers to test the efficiency of spraying for the prevention of this disease. The details of the work and the results of the experiment are reserved for a future publication.

The apple leaf spot was due to frost injury and resulted in the early defoliation of some of the orchards. Those orchards which were in good condition were less seriously affected than neglected trees grown under unfavorable conditions. No fungus was observed and the spotting of the leaves is attributed to the injury caused by the low temperature occurring during the early part of the season.

The strawberry disease mentioned appears to be a new one. It was first observed in the withering and dying of the fruit stalks, followed by the same effect upon the leaves. An examination of these parts showed no fungus, but the roots were found in all cases to be in poor condition. Further examination showed a fungus growth present in nearly all roots of affected plants, but attempts to obtain cultures in order to determine definitely the organism failed, as did attempted inoculation experiments.

The authors report the occurrence on plums, particularly the Japanese varieties, of a disease very similar to the yellows of the peach. This trouble is characterized by the production of wiry, yellow shoots, just as in peach yellows.

A brief account is given of spraying experiments for the control of the linden leaf spot (*Cercospora microsora*) and elm leaf spot (*Dothidella ulmea*). These trees were sprayed with Bordeaux mixture. The sprayed trees retained their foliage much longer than those not so treated. It is estimated that in the case of linden trees sprayed twice during the season a gain of from 2 to 5 per cent in growth and development would be obtained at an almost insignificant cost.

A brief account is given of the growing of various crops under tent cloth, the experiment being suggested by the success attained in growing Sumatra tobacco. Cucumbers, watermelons, tomatoes, etc., were grown under cloth shade and, so far as the vegetative growth and freedom from disease were concerned, the experiment was very successful; but the plants did not set fruit as well as those grown in the open. This was due probably to a lack of insect visitors.

Experiments in heating soils, G. E. STONE and R. E. SMITH (*Massachusetts Sta. Rpt. 1902, pp. 38–40*).—On account of the widespread interest taken in the problems

of soil sterilization, the authors have conducted a number of experiments to test the efficiency of various methods of steam sterilization. The efficiency of 1 and 2 in. iron pipes, 2-in. colander tin, 2-in. galvanized-iron pipe with different numbers of perforations, and 2-in. tile was investigated. The experiments show that the 2-in. pipe is superior to the 1-in. pipe where the number and size of the perforations are the same, and for all practical purposes perforations ¼ in. in diameter are better than smaller ones. The best results were obtained with a section of Cartter's tubes which contained 4 rows of perforations ¼ in. in diameter. In sterilizing soil there are many factors which must be taken into consideration, among them the pressure and amount of steam supplied, the size of the apparatus, and the amount of earth to be heated.

Notes on some plant diseases and spraying experiments, B. D. Halsted and J. A. Kelsey (*New Jersey Stas. Rpt. 1902, pp. 398–422, pls. 3, figs. 5*).—Notes are given on the club root of turnips in which the authors discuss the possibility of infection through the eating of raw turnips and similar plants. Descriptions are given of the mildew of Lima beans and suggestions for the control of this disease, and notes on the asparagus rust, fungicides and spraying, fungi as related to weather, and a list of species of parasitic fungi observed in a number of localities.

The observations on the asparagus rust seem to indicate that this disease is widely spread, reports having been obtained from many widely separated regions throughout the United States. From the continued experiments at the station the variety Palmetto seems to be most resistant of any under observation, and Argenteuil almost equally so, while Mammoth, Columbian, Colossal, etc., have at least 75 per cent of their plants affected.

The authors note the occurrence of broom rape (*Orobanche ramosa*) as occurring on a coleus plant grown in a pot in the greenhouse. In a previous report this parasite was noted as occurring on tomato, and the present account probably adds a new host plant to the already long list of species known to be subject to attacks of this parasite.

The experiments described with fungicides and spraying include the use of kerosene emulsion as a fungicide in greenhouses, and field trials with soda-Bordeaux mixture. The kerosene emulsion described proved to have considerable value as a fungicide under the conditions of the experiment, as shown upon plats of verbenas, phlox, and other ornamental plants. The field trials with soda-Bordeaux mixture gave negative results, the conditions following the second application being such that further sprayings were discontinued.

Report of the department of botany, H. L. Bolley (*North Dakota Sta. Rpt. 1902, pp. 34–65, pls. 4, figs. 3*).—A detailed report is given of the principal operations conducted by the botanist and his assistant during the year, particular attention being given to the flax wilt, which has already been the subject of a bulletin (E. S. R., 14, p. 55), and a description of a continuous process of treating flaxseed with formaldehyde vapor, which has already been described (E. S. R., 14, p. 983). Notes are also given on water hemlock (*Cicuta maculata*) and water parsnip (*Sium cicutæfolium*). The poisonous properties of these weeds are pointed out and suggestions made for their eradication. Brief outlines are given on the work on plant diseases, soil fungi, and bacteria; plant breeding, forage, and grass studies; economic plant survey of the State, seed-control studies, physiological experiments with trees, and bacteriological analyses.

Results of cooperative experiments in treating for oat smut in 1902, W. Lochhead (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 31–34*).—A brief account is given of the results of treating oats with copper sulphate and with formalin for the prevention of smut in the subsequent crop. Two methods of treatment were adopted. In the first the seed was sprinkled with the solution, and in the second it was immersed for 12 hours in the copper sulphate or for 20 minutes in the formalin solution. Comparing the average number of smutted heads from the different plats,

both treatments greatly reduced the percentage of diseased ones, those treated with formalin being almost entirely free from the smut. The author believes that where the convenience and efficiency of treatment are concerned the formalin is to be preferred above any of the other methods that have been suggested for the prevention of oat smut.

The bacterial disease of the potato, E. MARRE (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 17, pp. 526–528*).—A report is given of investigations relative to the bacterial disease of potatoes due to *Bacillus solanincola*. Inquiries were sent out to a number of correspondents during 1902, and from the replies the author concludes that the disease is influenced by atmospheric conditions, dry, hot weather aiding in its spread. The entrance of the organism to the plant is favored by the presence of leaf-eating and stem-sucking insects. Most of the correspondents reported less disease on plants grown from whole tubers than from cut seed, and marked differences in varietal resistance are noted. Early or very late planting gave the best results, as such plants escaped the dry, hot weather which favored the spread of the disease. However, early and late seeding and resistant varieties can not be absolutely depended upon as means of preventing attacks of this disease. Treating the seed tubers with formalin, corrosive sublimate, and copper sulphate solutions gave no positive relief. Sulphur and ashes dusted over the tubers in the drills before covering was thought by some to be of value, and this treatment will be given further trial.

Potato blight (Cercospora concors), G. LAGERHEIM and G. WAGNER (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 1, pp. 6–13, pls. 2*).—The history of the appearance of this potato disease is discussed at some length. It has been observed during the last 10 years at a number of places in Germany, Bohemia, and Austria. On its appearance in Uphland, Sweden, in August, 1902, it was studied by the authors as to its morphology and mode of development. Spraying with Bordeaux mixture is suggested as the best method of combating the disease, besides burning all the infected plants.—F. W. WOLL.

Potato blight and rot, W. T. MACOUN (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 42–47, maps 2*).—Popular descriptions are given of the early blight (*Alternaria solani*) and the late blight or rot (*Phytophthora infestans*). Cooperative experiments have been carried on in Ontario for the prevention of these diseases, and the average net results show profits ranging from $37.22 to $69.62 as a result of the increased production due to the spraying.

The internal action of copper sulphate in the resistance of potatoes to the potato rot, E. LAURENT (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 23, pp. 1040–1042*).—On account of the great sensitiveness of the spores of *Phytophthora infestans* to copper salts, the author has conducted a series of experiments to test the possibility of producing tubers that will not be susceptible to the attacks of this fungus. The experiment was begun in 1901, varieties of potatoes exceptionally subject to disease being grown in pots to the soil of which sulphate of copper was added at the rate of 1 part to 1,000 of soil. During that season the potato rot did not appear, so that the results of the treatment could not be determined. It was continued, however, a second year, and in August the disease appeared in considerable abundance. Tubers were harvested and those of one variety were cut in two, their cut surfaces placed in contact with the leaves of potato carrying the mildew. These were examined after 4 days, and those tubers which had been grown in the pot containing copper did not show any infection, while the check ones were infected in a very decided manner.

An analysis of the tubers grown in the pots showed that they contained 1 part of copper to 20,000, while tubers grown without copper added to the soil did not show the presence of any copper. An attempt was made to protect tubers against the fungus by soaking them for 20 hours in from 2 to 5 per cent solutions of copper sulphate. After this treatment they were washed in water and exposed to leaves carrying the Phytophthora. The parasite developed equally vigorously in all the speci-

mens, showing that this method can not be relied upon to secure immunity from attack.

Spraying potatoes, W. T. Macoun (*Canada Expt. Farms Rpts. 1902, pp. 117–120*).—During the season covered by the report experiments were carried on to compare the value of Bordeaux mixture, either in connection with Paris green or without, and a patented fungicide and insecticide known as Bug Death. The comparative efficiency of the different treatments is shown, from which it appears that Bug Death is not nearly as economical for use as is Bordeaux mixture, with or without Paris green. In 9 out of 11 tests the yield, where Bordeaux mixture and Paris green were sprayed over the plants, was considerably greater than where the other fungicide was used. There is no evidence to show that Bug Death has any value as a plant food, as is claimed, and vines which had received this preparation were no more vigorous than those sprayed with Bordeaux mixture and Paris green.

The effect of black rot on turnips, E. S. Smith (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 29, pp. 20, pls. 14*).—This bulletin consists of a series of photomicrographs, accompanied by an explanatory text, and is in continuation of the previous papers published by the author on this disease (E. S. R., 9, pp. 847, 849). In this paper attention is confined to the action of the parasite on the host plant, the previous discussions treating of the morphology and cultural peculiarities of the parasite. So far as the author is able to determine, the organism causing the black rot is capable of dissolving the cell wall proper, and this action is progressive, as shown by the fact that many of the cell walls observed in the infected portion of the plant are only one-third to one-fourth as thick as the walls of adjacent uninjured cells. The action is probably enzymatic and proceeds rather slowly.

Fungus diseases and other injuries, W. T. Macoun (*Canada Expt. Farms Rpts. 1902, pp. 111, 112*).—Brief notes are given on the occurrence of the sooty fungus or fly-speck fungus of apples, which is caused by *Leptothyrium pomi*, a rusting of apples which is attributed to improper spraying, a serious defoliation of trees, the cause of which was not definitely determined, and the black rot of cabbage. Notes are given on the preparation and use of fungicides and the value of these, particularly Bordeaux mixture, in controlling certain plant diseases.

Report on fungus diseases on cultivated fruits, F. W. Faurot (*Missouri Fruit Sta. Bul. 6, pp. 24, figs. 9*).—Illustrated descriptive notes are given of a number of fungus diseases observed during the season of 1902 as affecting apples, peaches, pears, plums, grapes, blackberries, and raspberries. Directions are given for preventing the occurrence of these diseases, so far as known, together with the results of the author's observations and experiments.

Fungus diseases of the apple, pear, and quince, F. L. Stevens (*North Carolina Sta. Bul. 183, pp. 64–82, figs. 10*).—Popular descriptions are given, with suggestions for prevention, of apple scab, apple rust, ripe rot, apple canker, black rot, and powdery mildew of the apple; fire blight, anthracnose, rust, canker, scab, and leaf spot of pear; and quince rust, fire blight, and fruit spot.

On scab and mildew of fruit trees, and methods of combating these diseases, J. Eriksson (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 1, pp. 53–71, pl. 1, figs. 10*).—The diseases described are apple-tree scab (*Venturia dendritica*), pear-tree scab (*V. pyrina*), and mildew of fruit trees (*Monilia fructigena*). For combating the scab diseases the author recommends immediate removal and destruction of fallen leaves from affected trees, and spraying or washing the bare trees with Bordeaux mixture or copper sulphate solution. In addition to this winter treatment, 2 or 3 sprayings during the spring and summer are advisable. The remedies advocated for combating Monilia are to gather and burn all rotten or dried-up fruit. On trees which have shown indications of disease all dried-up flower clusters are removed before the following spring and the diseased parts are cut off and burned. Affected trees, particularly the young branches, should be sprayed at the beginning

of the winter and early in spring, before the buds open, with a 2 per cent Bordeaux mixture. The ground beneath and around the diseased trees should be strewn quite thickly with lime.—F. W. WOLL.

Crown gall, G. C. BUTZ (*Pennsylvania Sta. Rpt. 1902, pp. 405–414, pl. 1*).—The distribution of the crown gall in Pennsylvania is indicated, and the author states that from 20 to 80 per cent of trees in orchards are frequently affected by this disease. It is said to have first made its appearance about 10 years ago on nursery stock brought from a western nursery, and seems to most seriously affect apples, peaches, and similar stock. The cause of this disease, which has been described in Arizona Bul. 33 (E. S. R., 12, p. 458), is attributed to the fungus *Dendrophagus globosus.*

Under the author's directions experiments with nursery stock were carried on with apple trees to test the efficiency of various treatments for the prevention of crown gall. Healthy trees set in infected lands developed the disease within a year or more. Where healthy trees were planted in infected land and finely powdered sulphate of copper distributed about the roots, no galls were found, but most of the trees had died as the result of a serious drought, and those remaining were so few in number as not to permit of any generalization regarding the efficiency of this treatment. Sulphur used in the same way had no effect in retarding the disease. When the roots of the trees were dipped in Bordeaux mixture there appeared to be some retarding of the development of the galls. Where the galls were cut from the young trees and the trees subsequently planted in clean lands, after a season or two the galls developed, showing that this treatment was of little value except in that it delayed the development of the disease. Cutting out the galls and dipping the trees in Bordeaux mixture, after which the trees were planted in clean soil, did not prevent the redevelopment of a fungus growth.

In conclusion, the author states that the disease is not strictly confined to the crown of the root system, but may develop on the stronger roots a foot or more from the crown. Some investigators, however, consider the galls formed at some distance from the crown as different from the crown gall, but the author believes that they are different manifestations of the same trouble. A list of trees is given upon which crown gall has been found, and while experiments have shown that the organism mentioned above was responsible for the production of galls on the almond, apricot, and peach, it has not been demonstrated that the same organism occurs in the crown galls upon apples, pears, plums, prunes, cherries, raspberries, grapes, English walnuts, and chestnuts.

Studies on the white rot of grapes, G. ISTVÁNFFI (*Ann. L'Inst. Centr. Ampelol., Roy. Hongrois, 2 (1902), pp. 288, pls. 24, figs. 12*).—A monographic study is given of *Coniothyrium diplodiella*, the fungus which is the cause of the white rot of grapes. After giving an historical review of the literature, the author describes the occurrence of the fungus in Hungary in 1901 and the following year. The effect produced upon the different parts of the grape, nearly all of which are subject to attack, are fully described. The fungus is described at length and the results of culture experiments are given. Numerous inoculations were made, different organs of the plant being successfully infected. The effect of fungicides upon the organism is discussed and preventive treatments recommended. According to the author, there are different forms of the fungus which attack different species of grapes as well as upon different parts of the vine, and specific names have been given them. Upon *Vitis vinifera* is found *Coniothyrium diplodiella* upon the fruit, young shoots, and leaves; *C. insitivum* on the canes, and *C. vitis* on the dying branches. On the leaves of *Vitis berlandieri*, *V. cinerea*, and other American species of grapes *C. berlandieri* is found. Accompanying the white rot are said to be a number of other fungi. Among those described are *Colletotrichum vitis* n. sp., *Botrytis cinerea*, *Pestalozzia uvicola*, *Cytospora ampelina*, various species of Capnodium, Verticillum, etc.

Numerous footnote references are given, which constitute a very extensive bibliography of the literature of the subjects treated.

Phthiriosis, a disease of grapes, L. Mangin and P. Viala (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 6, pp. 397–399; Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 10, pp. 316–318; Rev. Vit., 19 (1903), Nos. 481, pp. 269–271; 483, pp. 329–335; 484, pp. 357–363; 485, pp. 385–388, pls. 2, figs. 16*).—An account is given of a disease of grapes which has caused considerable injury in the vineyards of Palestine and adjacent countries. The disease is due to the combined attacks of *Dactylopius vitis* and *Bornetina corium*, n. sp. The attack is made upon the roots, and specimens of all ages show a peculiar thickening of the root which is more or less cylindrical, having when fresh a decided elasticity, but in drying becomes hard and brittle. If these enlargements which surround the root be examined they will show a flocculent mass made up of a mass of insects and the mycelium of the fungus. The root itself will be found to be in various stages of disorganization. The insect punctures the roots, and from the exuding sap is formed a substratum in which the fungus readily develops. In this way a sort of symbiosis is established between the two, resulting in the destruction of the plant. Experiments have been conducted which indicate that the injection of carbon bisulphid about the plants during the early stages of the disease, before the mycelium has made an impenetrable felt about the roots, will destroy the insect. If the treatment be put off too late in the season the Dactylopius within the mass of mycelium will not be reached by the insecticide.

A disease of chestnut, L. Mangin (*Jour. Agr. Prat., n. ser., 5 (1903), No. 9, pp. 278, 279*).—For a number of years the author has had under observation a disease of chestnut trees which seems to be widely distributed throughout France and which has caused the destruction of many trees. Two forms of the disease seem to be recognized, the first of which is due to the weakening of the trees by injury, removal of forest cover, lack of fertility in the soil, etc. The second type, which is the one described, is due to a fungus, and is found in all soils and exposures equally affecting young and old trees. It seems to spread from definite centers, on which account it has been called phylloxera from its resemblance to the spread of that disease in the grape. The aerial parts of the trees seem to be unaffected, but the roots are more or less discolored by the fungus which seems to attack the mycorrhiza, which is symbiotically associated in the growth of the chestnut tree. The parasite consists of a very delicate mycelium which attacks the mycorrhiza, causing its destruction. A study has been made of the fungus, and the author states that it apparently constitutes a new genus associated with Oomyces, and he has given to it the name *Mycelophagus castaneæ*. Although experiments do not seem to have been made, the author recommends the destruction of the parasite by injecting carbon bisulphid about the trees and the destruction of those which show evidence of attack. The use of carbon bisulphid can be recommended only in case of exceedingly valuable trees which are planted in soils where that material can be used to an advantage.

A disease of conifers (*Jour. Bd. Agr. [London], 10 (1903), No. 1, pp. 17–21, pl. 1*).—A description is given of a rather serious disease of coniferous trees, which is caused by attacks of the fungus *Botrytis cinerea*. So far this fungus has been observed occurring on the larch, silver fir, spruce, and sequoia seedlings. The disease has been under observation for 2 years and has proved very destructive to seedlings of larch and Scotch pine. The fungus causes the diseased shoots to curve down or become twisted, the leaves die and separate themselves from the branches, but are frequently prevented from falling by the formation of a web-like mat of mycelium. So far as the observations in England are concerned, this disease is quite abundant in nurseries and seed beds, and particular attention should be given to prevent the growth of weeds which would result in keeping the seedlings damp and shaded. Where the disease is prevalent it is suggested that the seedlings should be sprayed with a mixture called the "violet" mixture. This consists of copper sulphate, 2 lbs.; copper

carbonate, 3 lbs.; potassium permanganate, 3 oz.; soft soap, 8 oz., and rain water, 18 gals. All diseased seedlings should be collected and burned.

A new Bordeaux powder, R. N. BIRD (*Missouri Sta. Bul. 60, pp. 93-103, figs. 5*).—At the request of the department of horticulture the author has made an investigation of a dry form of Bordeaux mixture which could be substituted for the usual formula. The powder devised is composed of 4 lbs. of copper sulphate and 4 lbs. of lime, the lime and copper sulphate each being dissolved or slaked in $2\frac{1}{2}$ gals. of water. Sixty pounds of air-slaked lime is sifted through a fine sieve. The milk of lime and copper sulphate solution are mixed and filtered so that most of the water is removed. The remaining wet material is thoroughly mixed with the 60 lbs. of air-slaked lime, after which the mixture is rubbed through a coarse sieve while still somewhat damp. When perfectly dry it is put through a fine-meshed sieve, and can be applied with any of the usual means for applying powders to plants. This powder contains about $3\frac{1}{3}$ times as much copper per gallon as liquid Bordeaux mixture. In order to reduce it to the usual proportion it should be diluted with about three or four times its bulk of powdered lime or with flour. The results of experiments in which practical tests were made of this powder are to be given in a forthcoming bulletin of the horticultural department of the station.

ENTOMOLOGY.

Report of the entomologist and botanist, J. FLETCHER (*Canada Expt. Farms Rpts. 1902, pp. 169–195, figs. 5*).—The chief enemies of cereal crops during the year were Hessian fly and locusts. The Hessian fly was excessively injurious in 1901, but disappeared almost entirely during the season of 1902. Notes are given on the conditions under which the insect was found during the season, but the cause of the disappearance is not well understood.

Locusts were present in large numbers and did considerable damage in Manitoba. Several remedies were tried, but the best success was had by the use of Criddle mixture, which, as recently modified, consists of 1 part Paris green thoroughly mixed in 60 parts of fresh horse manure, to which 2 lbs. salt is added to a half barrel of the mixture. The mixture is then scattered along the edge of the infested field and serves as a poison bait.

Notes are given on the habits, life history, and injuries of the pea weevil, pea moth, and destructive pea aphis. The remedies suggested against the pea weevil are fumigation, holding over the seed, treating with kerosene, and scalding the seed.

San José scale has been found to be difficult to control, but in the experience of the author trees may be kept in a bearing condition by the use of kerosene emulsion applied twice during the summer, whale-oil soap at the rate of $2\frac{1}{2}$ lbs. to the imperial gallon of water, or by fumigation with hydrocyanic-acid gas. Two new strawberry pests were observed, but no great damage was done by them. These insects are *Mesoleuca truncata* and *Scopelosoma tristigmata.*

A report on the apiary is given by J. Fixter. A test was made of the comparative value of Langstroth, Hedden, and 2 other kinds of hives. The best results were obtained from the Langstroth hive. Experiments in feeding sugar sirup for winter stores showed that bees thus treated passed through the winter in good condition, without the development of dysentery or other diseases. Experiments with brood foundation of different sizes indicated that the best returns were to be had through the use of strips of foundation about 1 in. wide. The question of injury to fruit by bees was tested by means of a number of experiments with peaches, pears, plums, grapes, strawberries, and raspberries. The results obtained confirm those of previous experiments and indicate that bees do not, under ordinary conditions, attack whole fruit of any kind. They do, however, suck the juice from fruit of which the skin has been punctured.

Report of the entomologists, C. H. and H. T. Fernald (*Massachusetts Sta. Rpt. 1902, pp. 45–47*).—During the year considerable attention was given to methods of combating San José scale, as required by the nursery inspection law of the State. The most important injurious insects during the year were brown-tail moth, gypsy moth, San José scale, elm-leaf beetle, etc.

Entomological department, R. A. Cooley (*Montana Sta. Rpt. 1902, pp. 80–87*).—The author presents a list of the more important injurious insects which have been found within the State. Brief notes are also presented on mosquitoes, grasshoppers, plant lice, flea-beetles, cottonwood-leaf beetle, cucumber flea-beetle, mealy bugs, and ants.

Report of the entomologist, J. B. Smith (*New Jersey Stas. Rpt. 1902, pp. 423–593, pls. 17, figs. 11*).—The author discusses miscellaneous outbreaks of injurious insects during the year 1902, including plant lice, fall webworm, strawberry weevil, rose beetles, grain insects, periodical cicada, and oak pruner. Brief mention is made of the present status of imported Mantidæ, cabbage insects, San José scale, and Chinese ladybirds. During the season considerable work was done in the way of inspecting orchards and nurseries. Insecticide experiments were carried on in the entomologist's experimental orchard. Black insecticide soap, used at the rate of 1 lb. in 6 or 7 gals. of water, was of little use as a remedy for San José scale. Agricultural soap also gave unsatisfactory results, while Calcothion proved quite effective. Brief extracts are given from the crop bulletin for the year. The author discusses the appearance of periodical cicada in New Jersey in 1902, together with notes on its distribution, life history, injuries, and measures for repressing it.

General directions are given for fumigating trees, greenhouses, small fruits, and infested buildings, with notes on the advantages and limitations of the method of fumigation. The author discusses also the present distribution of the Chinese ladybird in New Jersey, and states that while no new experiments have been made with crude petroleum at the station, numerous satisfactory reports have been received from fruit growers who have used this remedy.

The author spent considerable time in the investigation of the mosquito nuisance. Notes are given on the habits and life history of the mosquitoes of New Jersey, with special reference to the conditions which are favorable or unfavorable to their spread. Mention is made of fish and other natural enemies of mosquitoes. The marshes around various cities were studied for the purpose of locating breeding grounds of mosquitoes and determining methods of combating the pest. It is urged that drainage or ditching is the method by which extensive breeding areas of mosquitoes can be rendered harmless.

H. P. Johnson presents a report on certain mosquitoes of New Jersey with special reference to malaria. The species studied were *Culex pungens*, *C. sollicitans*, *Anopheles punctipennis*, *A. maculipennis*, and other less important forms. Notes are given on meteorological conditions, breeding habits, and natural enemies of mosquitoes, the duration of larval and adult life, the relative proportion of the sexes, food of the larvæ, biting habits, and the agency of mosquitoes in the transmission of malaria.

Report of the State entomologist, J. B. Smith (*New Jersey State Bd. Agr. Rpt. 1902, pp. 101–108*).—Reference is made to the introduction into this country of *Chilocorus similis*, and the effect of this and related species of ladybirds upon San José scale. Notes are given on the work of State inspection and relationship between the duties of inspection officers and those of investigators. Mention is also made of the injury caused by sinuate pear borer.

Eighteenth report of the State entomologist on injurious and other insects of the State of New York, E. P. Felt (*New York State Mus. Bul., 1902, No. 64, pp. 89–193, pls. 6, figs. 2*).—Notes are given on the habits, life history, and means of combating brown-tail moth. This insect is believed not to occur in the State. The carrot-rust fly (*Psila rosæ*) has been found injuring celery as well as carrots. Notes

are given on the introduction, distribution, and life history of this species. The insect is also described and notes are given on its natural enemies and artifical means of repression. In fighting the insect the author recommends the use of kerosene emulsion, late sowing, rotation of crops, destruction of the insects in stored roots, and fall cultivation. Brief notes are also presented on a number of injurious insects, including tent caterpillar, bud moth, apple-tree bucculatrix, raspberry-cane maggot, clover mite, fall webworm, Hessian fly, pea weevil, elm-leaf beetle, white-marked tussock moth, bollworm, willow curculio, nun moth, walnut caterpillar, birch-tree bucculatrix, periodical cicada, ladybirds, praying mantis, and Chinese praying mantis. A list is given of introduced insects of primary economic importance affecting various cultivated crops. The author summarizes his experimental work in controlling San José scale as follows: Spring applications of crude petroleum emulsion have proved uniformly satisfactory. Whale-oil soap is a valuable insecticide when applied in the fall. Lime-sulphur-salt wash did not give perfectly satisfactory results. A brief account is presented of the voluntary entomological services throughout the State and a list is given of Coleoptera collected at Newport, N. Y., by D. R. Young. As usual in these reports a list is given of the publications of the entomologist during the year.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 5 (1903), No. 4, pp. 237-334, pls. 2*).—This number of the proceedings contains the following papers read at meetings of the society: Myrmecosalius, a New Genus in the Ceropalidæ, by W. H. Ashmead; Neuropteroid Insects from Arizona and Note on *Ceria willistonii*, by N. Banks; Notes on the Orthoptera of Bermuda, with the description of a New Species, by A. N. Caudell; The Genera of the Dipterous Family Empididæ, with Notes and New Species, by D. W. Coquillett; Myrmeleonidæ from Arizona; and the Odonata Collected by Messrs. Schwartz and Barber in Arizona and New Mexico, by R. P. Currie; Notes on *Crambus offectalis* and Allied Forms (*Eretria neomexicana*); New North American Lepidoptera, with Notes on Larvæ; A Note on *Pyrausta ochosalis;* Note on a Wrongly Identified Species of Tortricidæ (*Phthinolophus indentanus*); and a Review of the North American Species of the Lepidopterous Family Anthroceridæ, by H. G. Dyar; On the Cicindelidæ of Southern Venezuela, by W. Horn; A Letter from Cuba, by E. A. Schwarz; A Revision of the Boreal-American Species of Nonagria, by J. B. Smith.

Government entomologist's report, E. E. GREEN (*Roy. Bot. Gard. Ceylon Adminstr. Rpts. 1902, pt. 4, pp. 11-14*).—Descriptive and economic notes are given on *Xyleborus fornicatus*, *Capua coffearia*, *Helopeltis antonii*, and *Heterusia cingala*, all of which are injurious to tea plants. Brief notes are also presented on insects injurious to cacao, rice, and cardamoms, together with an account of mosquitoes, white ants, acetylene trap, fumigating apparatus, scale insects, sericulture, lac insects, etc.

Insect enemies of the apple, pear, and quince, with methods of treatment, F. SHERMAN, JR. (*North Carolina Sta. Bul. 183, pp. 45-63, figs. 11*).—Economic and biological notes on woolly aphis, round-headed apple-tree borer, flat-headed apple-tree borer, fruit bark beetle, scurfy scale, oyster-shell bark louse, San José scale, apple aphis, apple-tree tent caterpillar, fall webworm, codling moth, plum curculio, and pear-leaf blister mite.

Orchard studies. IV. Remedial measures against San José scale, W. B. ALWOOD (*Virginia Sta. Bul. 131, pp. 149-169, figs. 2*).—A brief account is presented of the appearance, habits, and means of combating San José scale. The remedies which have proved most successful in various localities are discussed. These include lye wash, soap washes, kerosene, crude petroleum, kerosene emulsion, and lime-sulphur-salt wash. Brief notes are also given on the natural enemies of the San José scale.

Insect pests of sugar cane, S. M. HADI (*The sugar industry of the United Provinces of Agra and Oudh. Allahabad: Frank Luker, 1902, pp. 45-51*).—White ants are reported as attacking sugar cane during the stage of germination and later. They appear in large numbers when the soil is dry. The young plant after germination

s eaten at the root and is rapidly destroyed. The preventive measures adopted by the natives consist in steeping the cuttings in a solution of the pounded leaves of *Adhatoda vasica*, in mustard cake, or in a solution of asafetida and common salt. An account is given of the life history of the sugar-cane borer and the usual remedies are recommended. Considerable injury is also reported from *Hieroglyphus furcifer*, plant lice, and a plant bug.

Observations on hymenopterous parasites of certain Fulgoridæ, O. H. SWEZEY (*Ohio State Univ. Bul., 7. ser., No. 23, pp. 8, pls. 2; reprint from Ohio Nat., 3 (1903), pp. 444–452*).—Brief notes on the habits and life history of *Dryinus ormenidis*, *Labeo typhlocybæ*, *L. longitarsis*, *Cheiloneurus swezeyi*, and *Gonatopus bicolor*.

The potato moth, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14 (1903), No. 4, pp. 321–326, pl. 1*).—A brief account of the distribution, appearance, life history, and injuries caused by this insect. A number of complaints have been made concerning the damage caused by this species in various parts of New South Wales. The methods recommended for controlling the insect are largely preventive, such as the destruction of food plants in the fall and keeping the insect out of storerooms.

Turnip and cabbage aphis, C. FULLER (*Agr. Jour. and Min. Rec., 6 (1903), No. 9, pp. 295, 296, fig. 1*).—This insect is reported as doing considerable damage to cabbage and related crops. In controlling the cabbage aphis the author recommends the use of kerosene emulsion, which may be sprayed with a knapsack sprayer, and the use of nicotin sheep dip.

The larva and pupa of the apple-bud borer (Steganoptycha pyricolana), E. D. SANDERSON (*Canad. Ent., 35 (1903), No. 6, pp. 158–161, figs. 5*).—Descriptive and anatomical notes, especially of the mouth parts of this species.

Bryobia ribis, R. VON HANSTEIN (*Sitzber. Gesell. Naturf. Freunde Berlin, 1902, No. 6, pp. 128–136*).—This species is reported as injurious to currants, and notes are given on its life history and anatomy.

Tortrix pilleriana, J. DUFOUR (*Chron. Agr. Canton Vaud, 16 (1903), No. 11, pp. 307–311*).—Notes are given on a number of insecticide applications which were made for the purpose of destroying this pest. These remedies included black soap, oil of colza, tobacco decoction, etc. The substances were for the most part applied hot. Good results were obtained wherever the temperature of the insecticide could be carefully regulated.

Precocious development of pupal and imaginal organs in lepidopterous caterpillars, H. KOLBE (*Sitzber. Gesell. Naturf. Freunde Berlin, 1902, No. 7–8, pp. 158–166*).—Anatomical notes on *Dendrolimus pini*.

Cicadas and their habits, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14 (1903), No. 4, pp. 334–341, figs. 8*).—Brief notes on the habits and life history of cicadas in general, and a detailed biological and economic account of *Cyclochila australasiæ* and *Thopa saccata*.

Galls and insects producing them, III, IV, and V, M. T. COOK (*Ohio State Univ. Bul., 7. ser., No. 20, pp. 419–436, pls. 6*).—The author investigated the histology of a number of lateral bud galls and stem galls and also studied the development of these structures. It was found that bud galls vary considerably, according to the kind of insect to which they are due. Stem galls are much less variable. A comparison is made between galls caused by mites, plant lice, Psyllidæ, Cecidomyia, Cynipidæ, and other insects.

The more important insect remedies for the month of June, H. A. SURFACE (*Pennsylvania State Dept. Agr. Mo. Bul. Div. Zool., 1 (1903), No. 2, pp. 8–16, pls. 2*).—Attention is called to the desirability of maintaining a good state of cultivation, using fertilizers, killing weeds, destroying badly infested plants and rubbish, in order to make specific remedial measures more effective. Brief directions are given with regard to the choice and application of remedies in combating insects injurious to fruit trees, field crops, small fruits, ornamental plants, and garden crops.

Experiments to test the value of Bug Death as compared with Paris green and Bordeaux and Paris green on potatoes, R. ROBERTSON (*Canada Expt. Farms Rpts. 1902, pp. 250, 251*).—The largest yield of potatoes was obtained from plants treated with Bug Death; but the cost per acre for a treatment of this insecticide was $8.40 for 2 applications, while 2 sprayings with Paris green cost only $1.15 per acre.

Chemistry of insecticides and fungicides, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 151–154*).—The author presents results of analyses of potassium cyanid, lime-sulphur-salt wash, and Bug Death. One sample of a substance labeled potassium cyanid was found to contain no potash; it proved to be sodium cyanid, from which apparently a larger quantity of hydrocyanic-acid gas could be obtained than from potassium cyanid. An experiment was made in adding potash to the California wash for the purpose of enhancing the value of this insecticide. The results indicated that the wash may be more apt to clog in the nozzle after the addition of potash, if the mixture is allowed to cool before spraying. An analysis of Bug Death indicated that this substance is chiefly an impure zinc oxid, and it is believed that the material can not act as a fertilizer, as is claimed, but may exercise a slight fungicidal action.

Notes on spraying and spray machinery, F. W. FAUROT and J. T. STINSON (*Missouri Fruit Sta. Bul. 5, pp. 24, pls. 7*).—The author discusses the subjects of insecticides and fungicides with special reference to their defects and the conditions of effectiveness. Measurements were made of the skin of a number of common varieties of apples for the purpose of determining whether the thickness of the skin was in any way connected with the degree of injury sometimes produced by Bordeaux mixture. No connection was found between these 2 factors. Detailed notes were given on the preparation of insecticides and fungicides and on the construction and management of spraying machinery. The bulletin includes a spray calendar in the form of a folio.

Pleasure and profit in honey production, D. E. LYON (*New Jersey State Bd. Agr. Rpt. 1902, pp. 295–306*).—A popular account of the biology of the honeybee and of practical methods for managing it with profit.

An original honey extracter, BLONDET (*Rev. Internat. Apicult., 25 (1903), No. 5, pp. 92, 93, fig. 1*).—A description of the advantages secured by the author in a simple form of honey extracter.

Ripe and unripe honey, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 163, 164*).—Analyses of capped and uncapped honey, which are taken as being equivalent to ripe and unripe honey, indicate that the honey from fully capped comb contains from 4 to 5 per cent less water than that from partly or entirely uncapped comb. The differences in moisture content observed in different samples of honey kept in bottles with glass stoppers and those covered with cheese cloth were exceedingly slight. Honey from uncapped or partly capped comb was found to possess poor keeping qualities and fermented more readily than mature honey.

Treatment of foul brood by means of eucalyptus, J. COMTAT (*Rev. Internat. Apicult., 25 (1903), No. 5, pp. 95, 96*).—Experiments were made with essence of eucalyptus as a remedy for foul brood. This substance was used in a number of ways, but without marked success, except when added in the form of a slightly alcoholic essence to the sirup used for feeding the bees in the spring.

FOODS—NUTRITION.

Dietary studies of groups, especially in public institutions, C. F. LANGWORTHY (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 387–410*).—The general problems which should be considered in providing a diet for large numbers fed under uniform conditions, as in public institutions, are discussed, and experimental data, which have to do with the feeding of armies, schools, hospitals, and other institutions and groups, summarized.

Canadian bakers' strong flour, F. T. Shutt (*Canada Expt. Farms Rpts. 1902, p. 160–162*).—Analyses of 4 samples of flour are reported and discussed.

Micro-organisms of the fermentation of black bread, Budinov (*Vyestnik Imp. Russ. Obsh. Akklimat. Zhiv. i Rast. Bakt. Agron. Stantz., No. 9, pp. 17–35; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 1, p. 116*).—The author studied the yeasts present in 2 samples of sour rye bread. Only one bacterium (*B. mesentericus pani viscosi II*) was found to be common to both samples, but representatives of the following 3 groups of micro-organisms were identified: (1) Peptonizing bacteria which turn the dough from thick to a more plastic state; (2) yeast which cause the dough to rise; and (3) lactic or acetic bacteria on which the sour taste and smell of the black bread depend.

The cultivation of the isolated organisms on sterilized dough was unsuccessful, owing to the difficulty of obtaining sterilized flour. It was found that the complete sterilization of the flour required a half hour's heating in an autoclave under 2 atmospheres pressure, but in this treatment the flour bakes together, darkens, acquires a specific odor and becomes unsuited to the preparation of dough and the cultivation of micro-organisms. The action of ether during 2 weeks does not sterilize the flour, and while formaldehyde vapor apparently acts better, the experiments with this have not been concluded. The author has begun the study of an anaerobic flora of yeast preparations.—P. FIREMAN.

ANIMAL PRODUCTION.

Analyses of feeding stuffs, E. F. Ladd (*North Dakota Sta. Rpt. 1902, pp. 21–27*).—Analyses are reported of hay from different sorts of millet, pigeon grass, red clover, timothy, and brome grass; of fodder from corn planted at different thickness and on different dates; of a number of varieties of millet seed and emmer, barley, corn, oats, and the following forage crops: Millet and oats, barley and oats, emmer, yellow Canadian field peas, white Russian oats, lupine grass peas, field peas and oats, Manshury barley, German millet, Japanese barnyard millet, and corn. Several varieties of wheat, and a sample of macaroni wheat flour, were also analyzed, the gluten and gliadin content being determined in addition to ordinary constituents.

Cattle-feed inspection, J. B. Lindsey (*Massachusetts Sta. Rpt. 1902, pp. 52–54*).—Notes are given on the extent of adulteration of feeding stuffs in the State during the year, and mention is made of new feeds placed on the market.

Fodders and feeding stuffs, F. T. Shutt (*Canada Expt. Farms Rpts. 1902, pp. 139–151*).—Analyses are reported of corn and clover silage, corn, clover, and sunflower silage, awnless brome hay (*Bromus inermis*), field brome hay (*Bromus arvensis*), upland and lowland hay, sedge hay (*Spartina juncea*), barley, oil cake meal, cocoanut cake, cotton-seed meal, gluten meals, corn oil cake, corn bran, wheat bran, calf meal, and mixed cattle feeds.

The author also analyzed a number of samples of mangel-wurzels, Sweedish turnips and sugar beets, reporting the average weight of root, dry matter and sugar in juice.

Methods of steer feeding, G. C. Watson and A. K. Risser (*Pennsylvania Sta. Rpt. 1902, pp. 271–279*).—In cooperation with the Pennsylvania State Department of Agriculture the comparative merits of fattening steers in pens and stalls was studied with 3 lots containing 5 animals each, the tests being a continuation of earlier work (E. S. R., 13, p. 880; 14, p. 684). After a preliminary period of 1 week the test began November 14 and continued 10 weeks. Lot 1 was fed in a large stall equivalent to 5 small ones. The steers in lots 2 and 3 each occupied small stalls. Lots 1 and 2 were supplied with water by means of automatic watering basins, while lot 3 was watered in a yard. The average daily gain per steer was 1.99 lbs. for the lot fed in large stalls and 1.49 and 1.52 lbs. for those fed in small stalls. Practically the same amounts of hay and straw were consumed by the 3 lots, but the amount of grain eaten

per pound of gain was 8.6 lbs. for the lot in the large stalls as compared with 11.2 and 11.09 lbs. for the lots in the small stalls. Less time was required for attendance when the steers were kept in the large stalls (79.5 hours) than when they were watered in small stalls (87 hours) or turned out to water (91.3 hours).

Considering this and the former tests the following general deductions were drawn: "While the gain was practically the same for an equal amount of food consumed, it was apparently in favor of the steers running loose in pens. The difference in the economy of food consumed is too slight to warrant a very definite conclusion, but the difference in time required for attendance is decidedly marked. With the use of the same amount of bedding and much less labor, the steers in the pens were kept cleaner than it was possible to keep those in the stalls."

Experiments with steers, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1902, pp. 253–260, 298–300, 351–354*).—In continuation of earlier work (E. S. R., 14, p. 178) the advisability of dehorning fully grown steers when fed loose or tied in stalls was tested at the Maritime Provinces Farm with 3 lots, each containing 4 3-year-olds. All were fed hay, roots, silage, and mixed meals for 5 months in the winter. The average gain of the dehorned steers fed in box stalls was 356 lbs. per head; of the dehorned steers tied in stalls 313 lbs., and of those fed in stalls but not dehorned 315 lbs.

Heavy and light steers for fattening were compared, using 2 lots of 4 animals each, averaging respectively 1,200 and 1,000 lbs. per head. In 5 months (December to May) the heavy steers made an average gain of 356 lbs. each and the lighter steers of 344 lbs. each. The cost of the feed was the same for both lots, "making a difference [in profit] in favor of the heavy steers of $5.01 per steer."

As in earlier work (E. S. R., 14, p. 178) limited and full rations were tested for a year with 2 lots of 5 calves each. Both lots were fed in the winter grain with roots and hay or hay and straw and were pastured in the summer, the lot fed the liberal ration receiving considerably more grain than the other and for a greater part of the time. The steers fed the full ration averaged 490 lbs. in weight at the beginning of the trial and made an average daily gain of 1.13 lbs. at a cost of 5.63 cts. per lb. Those fed the limited growing ration weighed at the beginning 392 lbs. on an average and gained 0.83 lbs. per head per day, the cost of a pound of gain being 3.99 cts.

In a second test under much the same general conditions 5 calves averaging 191 lbs. each fed a full fattening ration for 198 days gained 1.64 lbs. per head per day, the cost of a pound of gain being 4.38 cts., and 5 calves averaging 121 lbs. each in weight made in the same time on a limited growing ration an average daily gain of 1.35 lbs., the cost of a pound of gain being 2.55 cts.

At the Manitoba Farm spelt straw was compared with hay made from brome grass (*Bromus inermis*) and from western rye grass (*Agropyron tenerum*) as coarse fodder for steers, these being fed in each case with an equal quantity of Swedish turnips and from 6 to 11 lbs. of mixed grain. The 4 steers fed brome-grass hay gained in the 16 weeks of the test a total of 675 lbs. The same number fed the western rye-grass hay gained 660 lbs. and 3 steers fed spelt straw gained 355 lbs. The average profit per steer for the 3 lots was about $19.80.

A comparison is also reported from the Indian Head Farm of western rye grass, cut straw, and brome grass, using 3 lots of 5 steers each weighing not far from 1,130 lbs. In every case with 14 lbs. of the coarse fodder tested was fed 16 lbs. of silage together with mixed grain. In the 16 weeks of the test the steers fed western rye-grass hay gained 830 lbs. at a profit of $11.23 per head. Those fed cut straw gained 1,040 lbs. at a profit of $17.21, and those fed brome-grass hay gained 910 lbs., the average profit being $11.74.

Cattle: Beef production, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1902, pp. 62, 63, 72–80*).—The station herd and Canadian cattle-feeding problems are briefly discussed, and in continuation of earlier work (E. S. R., 14, p. 178) several feeding tests are reported. Using 3 lots of 9 steers each, the relative merits of different

ethods of handling steers were studied. The steers in lot 1 were not dehorned and ere tied in stalls, each animal having 56 sq. ft. floor space. Lots 2 and 3 were ehorned and were kept loose, having 84 and 38 sq. ft. of floor space per steer, espectively. The average live weight of the steers at the beginning was not far om 1,200 lbs. and all were fed meal, silage, roots and hay for 186 days. Lot 1 (tied p) made an average daily gain of 1.65 lbs. per head at a cost of 6.22 cts. per lb. Lot (large space) gained 1.77 lbs. at a cost of 6.02 cts. per head, and lot 3 (smaller space) ained 1.86 lbs. at a cost of 5.41 cts. per lb.

The influence of the age on the cost of beef production was tested with 3-year-olds, -year-olds, yearlings, and calves, the first 3 lots containing 9 animals each and the ast 5. During the trial (180 days for the calves and 186 days for the others) all the nimals were fed meal, silage, roots, and hay. The 3-year-olds made an average aily gain of 1.65 lbs. each at a cost of 6.22 cts. per lb. The 2-year-olds gained 1.67 os. at 5.7 cts., the yearlings 1.85 lbs. at 4.65 cts., and the calves 2.14 lbs. at 3.6 cts. er lb. "In daily gain and cost of production there is a quite remarkable gradation n favor of the younger classes."

Under practically the same conditions as in earlier work (E. S. R., 14, p. 178) the elative merits of light and heavy rations were tested with 2 lots of 5 yearlings each, veraging 443 and 405 lbs., respectively, and 2 lots of 6 calves each, averaging 111 nd 113 lbs. each. In 1 year the yearlings fed the heavy ration made an average aily gain of 1.76 lbs. at an average cost of 4.33 cts. per lb., and those fed the light ation 1.15 lbs. at 3.37 cts. In 200 days the calves on the heavy ration gained on an verage 1.45 lbs. per head per day at a cost of 3.7 cts. per lb. and those on the light ation 1.33 lbs. at 2.96 cts. per lb.

Flesh and fat in beef, D. H. OTIS (*Kansas Sta. Bul. 118, pp. 185-212, figs. 17*).—For the purposes of class demonstration a large fat steer 38 months old weighing 1,790 bs., a prime steer 24 months old weighing 1,240 lbs., a poor thin cow of the sort known as a "canner" weighing 975 lbs., a "baby beef" heifer weighing 775 lbs., nd a mature grade bull were judged by an expert. All but the latter were slaughered and cut up, the dressed weight ranging from 41 per cent in the case of the thin cow to 66.5 per cent of the live weight in the case of the large fat steer. The tallow of the latter constituted 6.7 per cent of the carcass and that of the prime steer 5.5 per ent. The various cuts from the different animals were compared and discussed at ength, a veal calf being included in this part of the work to make the comparison more complete. The fat on both of the steers was pronounced of fine quality and not tallowy. Baby beef loin was free from waste fat and while not as juicy and possibly lacking the flavor of the 2 steers, the meat was tender and every portion of he carcass could be used. The cooked meat prepared in several ways was judged by a number of persons, the fat steer, the prime steer, and the baby beef ranging as regards flavor in the order mentioned when broiled or roasted. When boiled the baby beef ranked first, the prime steer second, and the fat steer third. "However, each sample if served upon the home table would be classed as excellent." The samples of boiled and roasted meat were weighed before and after cooking, but the data obtained are considered insufficient for general deductions.

Division of animal nutrition, H. P. ARMSBY (*Pennsylvania Sta. Rpt. 1902, pp. 280, 281*).—Brief statements are made regarding the work of the past year which had to do with the construction and calibration of the respiration calorimeter designed for experiments with animals, which has been built in cooperation with the Bureau of Animal Industry of this Department. The author notes that in a check experiment in which 729.9 cc. of alcohol was burned in the respiration chamber, the carbon dioxid and heat measured agreed very closely with the theoretical amounts. It is calculated that this quantity of alcohol would furnish 1,023.19 gm. carbon dioxid and 3,844 calories of energy. The amounts measured by the calorimeter were 1,023.60 gm. carbon dioxid and 3,829 calories.

"It will be seen that the errors were less than one-half per cent, a degree of accu racy which compares favorably with the most exact laboratory methods. Th results for the water produced were not so satisfactory, but the source of this erro has been apparently discovered and it is anticipated that later tests will give mor satisfactory results."

Sheep, J. H. GRISDALE and R. ROBERTSON (*Canada Expt. Farms Rpts. 1902, pp. 8 261*).—Brief notes regarding the sheep kept at the Central and Maritime Province Experimental Farms.

Sheep, W. H. DALRYMPLE (*Louisiana Stas. Bul. 74, 2, ser., pp. 197–216, figs. 11*).– The importance of improved breeds is urged, the principal breeds of sheep ar described, and sheep raising is discussed with special reference to local condition the experience of the station in raising sheep and the cultivation of different cro suited to their needs being briefly cited.

Digestion experiments with sheep, J. B. LINDSEY ET AL. (*Massachusetts St Rpt. 1902, pp. 82–101*).—This gives in tabular form the results of 185 trials with 7 feeding stuffs made at the station during the period from 1894 to 1902. The coeff cients of digestibility have been published from time to time in the reports of th station. The influence of drying and curing on digestibility was studied with whea sand vetch, and barnyard millet. The curing process apparently did not affect th digestibility of the wheat and vetch, while it noticeably decreased that of barnyar millet.

The pentosans, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1902, pp. 69–81*).—Th author reviews the literature relating to the determination and digestibility of pe tosans, and reports in tabular form the experiments on this subject which have bee made with sheep at the station, the principal data obtained being summarized in th following table:

Digestibility of pentosans and other constituents in experiments with sheep.

Feed stuff.	Pento-sans in feed.	Digestibility.				
		Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Pento-sans.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cen*
English hay, average 6 tests	21.28	59.73	49.49	60.39	61.03	[a] 62.
Meadow or swale hay	18.25	33.88	43.60	46.03	32.97	28.
Barnyard millet hay	23.35	63.67	46.34	51.58	61.59	60.
Black grass, average 2 tests	25.08	58.58	43.58	52.69	58.92	55.
Fox grass, average 3 tests	26.77	59.67	35.61	52.79	53.02	48.
Branch grass, average 2 tests	26.28	56.97	34.06	49.76	54.33	49.
Cove mixture (black grass and redtop)	22.24	47.92	40.33	53.19	59.68	53.
Salt mixture (fox grass and branch grass)	24.09	41.72	27.90	52.28	57.51	48.
Flat sage (*Spartina stricta maritima*)	23.82	51.77	36.14	55.05	60.42	58.
Buffalo gluten feed, average 2 tests	16.93	86.04	87.29	84.16	66.02	82.
New process linseed meal	13.21	87.24	91.01	85.51	61.23	88.
Old process linseed meal	13.24	88.79	88.59	77.55	57.02	83.
Corn cobs	30.35	17.38	50.11	60.04	65.33	63.
Dried brewers' grains	23.77	79.26	91.11	57.83	52.57	56.
Wheat bran, average 2 tests	26.08	79.08	68.07	70.40	39.93	63.
Atlas meal	12.76	72.80	91.24	84.45	105.70	90.
Peanut feed	20.69	70.56	89.68	49.05	11.68	40.
Soy-bean meal	5.18	90.05	85.02	72.17	50.42	64.

[a] Five tests only.

The conclusion is drawn "that the pentosans are as digestible as any of the oth fodder groups (except in the presence of excessive incrusting substance), and th the digested material is practically utilized in the animal organism to the same degr as the other carbohydrates."

Swine, J. H. GRISDALE, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Cana Expt. Farms Rpts. 1902, pp. 80–81, 260–261, 300–302, 354*).—At the Maritime Pro inces Farm the relative merits of feeding in pastures and pens was studied with

lots, each containing 10 pigs 2 to 4 months old, weighing not far from 50 lbs. each. Both lots were fed a ration of 3 lbs. of buckwheat, shorts, and wheat bran with 5 lbs. of skim milk. In each case 3 of the pigs were fed for 85 days, 3 for 102, and the remainder for 120 days. The average daily gain of the pigs fed in pens ranged from 1.01 to 1.34 lbs., and those fed in pasture from 1.13 to 1.3 lbs. per head.

At the Manitoba Experimental Farm the value of lamb's quarter seed (*Chenopodium album*) as part of a ration was studied. This material was boiled, mixed with chopped oats, barley, and wheat screenings, 2:1:1, and fed wet for 76 days to a lot of 2 crossed breed Tamworth pigs. They weighed together when purchased 337 lbs. and gained 221 lbs., the estimated profit being $5.04. Two similar pigs fed the grain ration without lamb's quarter seed gained 230 lbs., the estimated profit being $4.22. "It would appear that lamb's quarter seed has a limited value as food for pigs."

In a test covering 82 days the feeding value of roots (potatoes and turnips, 2:1) as part of a ration was studied with 2 lots of 2 pigs each, averaging less than 100 lbs. in weight. The roots were boiled, mashed and mixed with ground barley, oats, and wheat screenings. The pigs fed this mixture gained 201 lbs.; and the 2 fed the same grain ration but no roots gained 195 lbs. The estimated profit in the 2 cases was $3.78 and $4.37.

"It would appear from this test that potatoes and turnips can be used to replace a portion of the grain ration but they are worth less than 20 cts. per bushel for that purpose."

Profitable pig feeding, G. W. WATERS (*Missouri State Bd. Agr. Mo. Bul., 2 (1903), No. 12, pp. 4–20, figs. 7*).—The possibility of feeding pigs profitably is discussed on the basis of experiment station work, and a number of tests at the Missouri Station are briefly quoted on the comparative value of blue grass, red clover, alfalfa, and rape as pasturage. In each case 6 pigs averaging about 40 lbs. in weight at the beginning of the trial were fed for a period of 90 days. One lot made an average daily gain of 0.71 lb. per pig on corn and blue grass, consuming 5.2 lbs. grain per pound of gain. On corn and green clover the second lot made an average daily gain of 0.87 lb. per pig, requiring 4.29 lbs. of grain per pound of gain. On corn and green alfalfa the average daily gain was 0.95 lb., and on corn meal and rape 0.78 lb., the grain required per pound of gain in the 2 cases being 3.97 and 4.82 lbs., respectively. For purposes of comparison, a lot of pigs was fed corn and skim milk and gained 1.81 lbs. per head per day, on an average, requiring 2.44 lbs. of grain per pound of gain.

In the author's opinion these experiments emphasize the value of supplementing a corn ration. It is further pointed out that when clover hay, alfalfa and skim milk were used cheaper and more rapid gains were made. The importance of different forage crops is discussed.

The swine industry in Missouri (*Missouri State Bd. Agr. Mo. Bul., 2 (1903), No. 12, pp. 3, 4*).—Statistics are given of the pig industry in Missouri as compared with other States.

The production of firm bacon, J. H. GRISDALE (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 41, 42*).—A general discussion, based on the work of the Canadian experiment stations. Feeding pigs too rapidly "feeding off," that is, marketing pigs before maturity, and feeding any ration not conducive to health the author believes will cause soft bacon. As regards feeding, "corn fed with a small proportion of skim milk or whey gives much better results [than corn only]. After the skim milk or whey constitutes 10 or 15 per cent of the dry matter of the ration, the proportion does not appear to greatly matter. . . . A small proportion of corn with the cereals, oats or barley, or with peas, does not appear to have a very injurious effect. Barley is unsurpassed as a feed for the production of firm bacon. Oats, also, are most excellent. Peas produce good results, and, mixed with other grains, are exceedingly valuable.

In conclusion, skim milk or whey are almost infallible guarantees of firm pork. The cereals and peas properly fed constitute an almost faultless ration. Corn may be fed, but must have some counteracting food along with it, or it will give bad results."

Horses, J. H. GRISDALE, R. ROBERTSON, and A. MACKAY (*Canada Expt. Farms Rpts. 1902, pp. 61-63, 252, 355.*)—Brief statements are made regarding the horses kept at the Canada experimental farms. On an average the cost of feed per horse per day was at the Central Experimental Farm 27.33 cts. and the cost of care 8 cts. additional. In a test made at the same place of the relative value of mixed grains fed with hay chopped into pieces about half an inch long, 7 horses, weighing about 1,400 lbs. each, gained, on an average 83 lbs. per head in 91 days on a daily grain ration of 17.33 lbs. ground oats. Three similar horses fed 18 lbs. per head daily of a mixture of equal parts of ground oats and barley made an average daily gain of 70 lbs. per head in the same time, and 3 horses fed 17 lbs. per head of ground oats and barley, 2:1, gained 52 lbs. each. "All the horses continued in good health during the experiment and so far as could be judged any one of the grain or meal rations was as good as another."

Experiments in chicken fattening, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 218-230, pl. 1*).—The food requirements of poultry are briefly discussed and a number of feeding tests reported. The relative gains made by different breeds on a ration of ground oats, ground barley, and meat meal (4 : 3 : 1) with sufficient skim milk to make a mash, and supplemented by whole wheat in the evening was studied with Barred and White Plymouth Rocks, Faverolles, Silver Gray Dorkings, Buff Orpington, Rhode Island Reds, White Indian Game, White Wyandottes, and Plymouth Rock × Light Brahma crosses. The number of chickens ranged from 4 to 6 per lot. In the 6 weeks of the test the average gains in weight ranged from 1 lb. 8 oz. with the White Indian Games to 3 lbs. and 2 oz. with the Plymouth Rock × Light Brahma crosses, the cost of a pound of gain ranging from 3.7 cts. with the cross-breed chickens to 4.7 cts. with Rhode Island Reds.

Unground and finely ground grain were tested with 2 lots of 6 Barred Plymouth Rock chickens 12 weeks old, weighing about 3.25 lbs. each at the beginning of the test, the feeding stuffs used being the same as mentioned above. The chickens fed the grain whole made an average gain of 1 lb. 10.5 oz. per head in the 6 weeks of the test, the cost of a pound of gain being 7.1 cts. Similar values for the chickens fed the grain finely ground were 2.12 lbs. and 5.6 cts. In this and the experiments described below the chickens were killed and dressed at the close of the trial and the proportion of edible and nonedible parts was ascertained and the flesh was cooked and its quality judged. As regards the effects of whole and ground grain, the birds fed the latter when dressed were plumper, slightly yellower, of better appearance "and were also considered to furnish on cooking the juicier or richer meat, due evidently to a marked (though not excessive) deposition of fat in the tissues."

The comparative merits of skim milk and water for wetting feed were studied with 2 lots each containing 3 Rhode Island Reds and 3 Orpingtons, weighing not far from 2 lbs. each, and 2 lots each containing 6 Barred Plymouth Rocks, averaging not far from 3.5 lbs. each. The ration was made up of ground oats, barley, and meat meal 4:3:1. In the 6 weeks of the test the Rhode Island Reds and Orpingtons fed the ration wet with skim milk made an average gain of 2 lbs 2 oz. per chicken while those fed the ration wet with water gained 1 lb. 13 oz., the cost of the pound of gain in the 2 cases being 4.7 cts. and 5 cts. The gains made by the Plymouth Rocks on the skim milk ration averaged 2 lbs. 10 oz. per head, the cost of a pound of gain being 5.7 cts. Similar values for the chickens fed the ration mixed with water were 1 lb. 15 oz. and 6.7 cts. It is stated that the chickens fed the ration wet with milk were decidedly better in appearance, being plumper and yellower when dressed, and more juicy and better flavored when cooked.

In continuation of earlier work (E. S. R., 14, p. 180) the relative merits of feeding chickens in pens and crates was studied with 2 lots of 6 Silver Grey Dorking pullets and 2 lots containing the same number of Barred Plymouth Rock cockerels, the former weighing about 2 lbs. and the latter between 3 and 4 lbs. each at the beginning of the trial. The ground oats, ground barley, and meat meal mixture wet with skim milk mentioned above were fed. The trial covered 4 weeks with the pullets and 6 weeks with the cockerels. The pullets fed in pens gained on an average 1 lb. 9 oz., and those fed in crates 1 lb. 6 oz. each; the cockerels fed in pens 3 lbs. 1.2 oz., and those fed in crates 2 lbs. and 7 oz., the cost of a pound of gain being, respectively, 3.3, 4.5, 5.7, and 6.8 cts. "All the birds were excellent table fowl, but the pen-fed presented the finer appearance as to color and size. Though it was difficult for some of those who tested the dressed meat to note any difference as regards juiciness, the majority considered the pen-fed fowl as the better in this respect."

Gluten meal and clover meal were tested with 2 lots, each containing 6 Barred Plymouth Rock cockerels weighing not far from 3 lbs. per head on an average. In 6 weeks the birds fed ground oats and gluten meal wet with skim milk made an average gain of 2 lbs. 9 oz. per head, at a cost of 4.6 cts. per pound. The cockerels fed ground oats, ground clover, and meat meal, gained 2 lbs. 3 oz., the cost of a pound of gain being 6.6 cts. The chickens fed the gluten meal were better filled out, of better color and finer appearance when dressed than the others, and their flesh was considered juicier and more delicate.

According to the author the gluten-meal ration "has given such satisfactory results from every standpoint that it merits further investigation. Gluten meal has shown itself with other classes of farm stock an easily digested, concentrated food of great value, and we are encouraged in further work with poultry to experiment with it in varying proportions with other meals. The indications are that it will prove a profitable flesh-producing food in chicken fattening."

Taking into account all the tests in which such data were recorded, the proportions of different materials removed in dressing and drawing the 72 chickens of different breeds, calculated on the basis of the weights of the chickens as killed, was as follows: Dressed and drawn carcass, not including the giblets, 66.4; giblets, 5.5; head and feet, 11.2; feathers, 8.3, and entrails, 8.5 per cent.

Poultry experiments, W. P. BROOKS and H. M. THOMSON (*Massachusetts Sta. Rpt. 1902, pp. 153–155*).—A brief summary is given of the results of feeding experiments with poultry during the year. Several feeding stuffs were compared in rations having different nutritive ratios. The more important results are stated as follows:

"In the comparison of wheat with corn, where beef scraps are the source of animal food, the egg production has been good and nearly equal on the 2 rations, although the hens receiving the wheat ration have been somewhat the most productive.

"In the comparison of wheat with corn, with milk albumin as the source of animal food, the egg production has been less satisfactory, and the hens which have received the corn ration have been the more productive.

"In the comparison of buckwheat and corn, with milk albumin as the source of animal food, the egg yield has been rather small, with the advantage decidedly in favor of the corn."

In the comparative tests of wheat and corn for several years the results have not been entirely consistent.

Report of the poultry manager, A. G. GILBERT (*Canada Expt. Farms Rpts. 1902, pp. 203–216, pl. 1, figs. 2*).—The conditions of success in poultry raising, early market types, and other problems are discussed and statements made regarding the progress of the station poultry. In order to ascertain the effect of close confinement, as compared with an abundance of fresh air, on the strength of germs and the number

and vitality of the chicks, a record was kept of the eggs set and chickens hatched from a number of lots of hens which were closely confined in a warm house during the winter, as compared with those which were allowed to run in cold, fresh air.

According to the author, the results showed that "the chicks from the eggs of hens which had voluntary run during winter proved strong and lived, while the chicks from the closely confined died, with the exception of 2, which did not make satisfactory growth. . . . Germs evidently became strong at 12 or 15 days after the hens had a run outside. This will answer a question often asked as to when the eggs of hens closely confined become strong. . . . Results from eggs put into an incubator during early springtime were very similar to those obtained from eggs under hens at the same period. There was a large and discouraging number of chickens dead in the shell, at or about the pipping stage. This great mortality in fully developed chickens almost ready to leave the shell has been and is the subject of much discussion. . . . Investigation into and discussion of the subject, up to the present time seem to warrant the call for 'fresh air and more of it for breeding stock and incubators.'"

Figures are given showing the gains made by the station chickens in 3 months. The weight of cockerels ranged from 3 lbs. 2 oz. in the case of White Wyandottes and Faverolles to 5 lbs. 1 oz. in the case of second cross Light Brahma × Barred Plymouth Rocks. The effect of early penning up of fowls was shown by the fact that 70 kept in a poultry house with a run during the month of November laid 192 eggs, while during the same time 147 hens and pullets allowed to run at large in a field laid 132 eggs. "The advantage is apparently with the penned fowls."

Brief statements are also made regarding the rations fed the station poultry, the eggs laid during the year, and during the months when prices were highest.

Subdepartment of poultry report, H. C. GARDINER (*Montana Sta. Rpt. 1902, pp. 96–100*).—According to the experience of the station, poultry houses may profitably be heated, an average temperature of 45–50° F. being regarded as most satisfactory. Little artificial heat is required in a properly constructed house while the sun is shining. "The most successful method of heating poultry buildings, and the only practical method for poultry plants, is a hot-water pipe system, but for the average building a small stove serves the purpose admirably."

The advantages of shade for poultry in summer are discussed. In the experience of the station, Mammoth Russian sunflower is very satisfactory for this purpose. The plant makes a large growth, affords abundant shade and also protection from hawks, while the mature heads are a useful feed. The need of green forage for poultry is also spoken of, clover being recommended for permanent pasturage and oats for early forage.

In the experience of the station Brown Leghorns are the most satisfactory breed for raising under local conditions. The results of 3 years' experimenting shows that the large combs and wattles, which are a disadvantage in a northern climate, may be greatly diminished in size by care, breeding, and selection.

Cooperative poultry experiments. The yearly record of three flocks, H. H. WING (*New York Cornell Sta. Bul. 211, pp. 261–279, fig. 1*).—With 3 of the flocks included in a test previously reported (E. S. R., 14, p. 486) the station has continued cooperative poultry experiments in order to secure data covering one year. The 3 flocks contained on an average from 290 to 509 birds, exclusive of males. In the year from December 1, 1901, to November 30, 1902, which includes the 3 months of the earlier test, the average daily egg production for the 3 flocks representing 1,250 fowls was 34.7 eggs per 100 fowls. The total yearly production per hen averaged 129.1 eggs, the average cost of food per dozen eggs was 9.2 cts., the cost of feeding a hen for the year 99.6 cts., and the average selling price of the eggs 21.4 cts. per dozen. "The average value of the eggs at market rates exceeded the cost of food by $1.31 per hen. Forty-four per cent of the total value of product was required for food."

Poultry experiments, C. CURTICE (*Rhode Island Sta. Rpt. 1902, pp. 333–373, pls. 7*).—Changes which have been made in the location of the poultry houses and in the plans for poultry work are described, and experiments with different kinds of incubators under a variety of conditions are reported, part of the experiments being made in connection with the regular work of students at the agricultural college.

In some of the tests differences were observed in the percentage of eggs hatched in different tiers of incubators, and this point was further studied to determine the effect of inside and outside temperature. It was found that the temperature inside the different tiers of incubators varied much less than the outside temperature. In some cases the largest hatch was obtained in an upper tier, in others in the lower, but in the author's opinion the increase in the percentage of eggs hatched could be directly attributed to more heat. The data obtained in the experiments, he believes, "show that too little heat arrests development. There seems to be no indication that an increase of heat to the amount used in these experiments kills the chicks in the later stages. The conditions found indicate that the majority exhausted their vitality in reaching the particular stage where death ensued, and that more heat favored further advancement."

The author states that, considering the year's work as a whole, only moderate success was obtained as regards the proportion of eggs hatched. "As a rule, the low percentage of efficiency in incubating eggs in winter has been ascribed to the condition of the winter egg and the hen; that is to say, it is claimed that the winter embryos have less vitality than the spring embryos. The winter experiments show, however, that, while no entire lot of hatches was extra good in any month, there were some in all of the months that were good, and in fact much better than the average for any month. This indicates that the hatching is at greater fault than the eggs. In other words, until more uniformity is obtained in handling machines of the same make, set in the same room at the same time, we must consider the weather and incubator conditions before complaining of the eggs."

Various problems connected with poultry hatching are discussed, and brief notes given regarding the broods tested and the post-mortem examination of chicks which died within 2 or 3 weeks after hatching. Some experiments have been begun for the study of "blackhead" in turkeys, and it is proposed to continue the work.

Poultry, R. ROBERTSON, S. A. BEDFORD, and A. MACKAY (*Canada Expt. Farms Rpts. 1902, pp. 261, 262, 302, 355*).—Brief statements regarding the poultry kept at 3 of the Canadian experimental farms. At the station for the Maritime Provinces a large percentage of the chicks hatched with incubators and under a hen died at the pipping stage, especially in the case of the early hatches.

Report of cooperative experiments in poultry work, W. R. GRAHAM (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 37–39*).—A brief report with discussion of cooperative experiments in hatching eggs with incubators.

The preservation of eggs, F. T. SHUTT (*Canada Expt. Farms Rpts. 1902, pp. 216–218*).—The relative merits of different methods of preserving eggs was tested in continuation of previous work (E. S. R., 14, p. 180), the materials used being saturated limewater, with and without common salt; sodium silicate (water glass), common salt, permanganate of potash, calcium chlorid, and magnesium chlorid. As in former years, the best results were obtained with the saturated limewater.

"This fifth season's work with egg preservatives furnishes further corroboratory evidence of the value of limewater. Of the solutions experimented with, it has proved the most satisfactory. It is certainly equal to water glass in effectiveness and is to be preferred to this much advertised preservative on the grounds of economy and ease of preparation. . . . The solubility of lime at ordinary temperatures is 1 part in 700 parts of water. Such a solution would be termed saturated limewater. Translated into pounds and gallons, this means 1 lb. of lime is sufficient

to saturate 70 gals. of water. However, owing to impurities in commercial lime, it is well to use more than is called for in this statement. It may not, however, be necessary, if good, freshly burnt quicklime can be obtained, to employ as much as was at first recommended, namely, 2 to 3 lbs. to 5 gals. of water."

Further experiments with thoroughbred geese, T. H. TAYLOR, Jr. (*Rhode Island Sta. Rpt. 1902, pp. 374-378*).—Experiments with geese made in 1901 in continuation of earlier work (E. S. R., 10, p. 990) are reported, Embden, Toulouse, African, Brown China, and White China breeds being compared. Brief statements are made regarding rations fed the geese. The egg production ranged from 5.75 per bird with the White China to 22.25 with the Toulouse, averaging 13.3 for all the breeds. The percentage of fertile eggs ranged from 12 with the Embden to 50 with the Toulouse, and the percentage of fertile eggs which hatched ranged from 31 with the Toulouse to 75 with the Brown China. After hatching, the goslings were fed at first fine cracked corn and bran moistened with hot water, and were allowed access to tender grass; when this was not available such green feed as cabbage, green rye, or lettuce was substituted. After 2 weeks they were given a mixture of equal parts of coarser cracked corn, ground oats, and bran, and after 8 weeks the oats were omitted and the amount of cracked corn increased. Twenty-three of the 25 goslings hatched lived to reach the age of 10 weeks, at which the birds were considered fit for market. The average weight then ranged from 4.75 with the Embden to 7.50 lbs. with the White Chinas.

"Under the circumstances the experiment indicates that the preference should be given to the Africans, as they seem to have done the best when the numbers averaged are considered. This, too, is in line with the popular opinion among those who raise thoroughbred geese for market. The Africans are generally acknowledged to be the quickest growing of any of the thoroughbred geese."

Experimental studies in oyster propagation, 1902, J. NELSON (*New Jersey Stas. Rpt. 1902, pp. 331-369, pl. 1, figs. 6*).—Continuing work previously reported (E. S. R., 14, p. 602), special attention was paid to the early development of the oyster embryo, one of the principal objects being to ascertain whether varieties of oysters differed in their developmental viability. The failure of fertilized eggs to develop as far as the shell stage, which was observed in most of the lots experimented with earlier, was attributed to one of the three following causes, namely, that the proper variety of oysters was not used, that the eggs were not properly handled, or that they were not in a proper stage of maturity. The experimental studies which were carried on do not, in the author's opinion, warrant final deductions, yet considerable information has been secured.

"First of all we found that native seed is not superior in developmental vitality to oyster seed imported from distant localities. Contrary to expectation, southern plants were found to equal or possibly to exceed native seed in developmental constitution. We found that the successful viability is not confined to any one variety of seed.

"Next, we found that the most careful handling of the eggs did not seem to secure the desired viability in the great majority of the experiments. In those experiments that showed the desired viability no especial care was taken.

"Thirdly, we worked with eggs of the very choicest appearance and as mature as possible, using both those that were just about to be spawned out and those that remained after the oyster had begun spawning.

"Apparently, as a result of careful selection in this regard, we obtained a higher percentage of viability during the season just past than during any previous season. This result is in harmony with our fundamental dictum, viz, that the success of oyster development depends on the inherent vitality of the eggs. Nevertheless, there are some puzzling features connected with the results of our experiments, and it seems as if it would be necessary to make a careful study of natural spawning on natural beds to clear up these matters."

DAIRY FARMING—DAIRYING.

Feeding dairy cows, D. W. MAY (*Kentucky Sta. Bul. 106, pp. 45–79, pls. 3*).—This is a general discussion of the principles involved in the feeding of dairy cows, including observations and results of experiments at the station and a review of considerable literature on the subject, references to which are given. Some of the results at the station may be noted. A nutritive ratio of from 1:5 to 1:6 has given the best results. Animals of the station herd scoring highest have been the largest and most economical producers of milk and butter.

The records of the herd for 4 years show an average decrease of about 5 per cent of milk and 3 per cent of butter per month during the first 4 months of the lactation period and an average decrease of 8.1 per cent of milk and 7.4 per cent of butter per month during the first 8 months. Data are given showing the decreased yield following irregular milking and other unusual conditions incident to the exhibition of cows at local fairs. Considerable variations in the character of the feed were followed by only small monthly variations in the fat content of the milk. Exposure of 18 cows to a very heavy rain for 2 hours in December caused a decrease in the yield of milk of 24.4 and 12.5 lbs., respectively, on the 2 days following. Exposure of cows to storms in summer had very little effect upon the yield of milk.

Cows receiving heavy rations of grain, silage, and clover hay in April showed a marked increase in yield upon being turned on rye pasture. Feeding grain to cows on pasture was unsatisfactory, 60 lbs. of grain being required to gain 2.9 lbs. of milk during the first week and 5.2 lbs. the second week. Silage was fed to cows turned on pasture in the spring with good results. The addition of sugar beets to a ration containing silage was found to be unprofitable. Experiments to determine the amount of grain that should be fed indicated that no hard and fast rule can be given. Bran gave slightly better results than shorts in comparative tests. The addition of linseed meal to a ration including bran and corn in the spring profitably increased the yield of butter. In the summer the increased yield was not sufficient to pay for the additional cost. Cotton-seed meal gave better results than bran when fed to cows on pasture. Cotton-seed meal was also profitably substituted for a part of the corn ration. Germ meal was compared with corn-and-cob meal, with results which, while somewhat conflicting, seemed to favor the germ meal.

The influence of a variety in the rations of dairy cows, H. HAYWARD (*Pennsylvania Sta. Rpt. 1902, pp. 314–320*).—Eight cows were fed a uniform grain ration for a period of 40 days, when they were divided into 2 lots, one lot being fed the same ration for a second period of 40 days and the other lot practically the same amount and kind of food but arranged in 2 rations alternating every 5 days. During a third period both lots were fed the control ration. Detailed data are given as regards the food consumed and the milk, fat, and solids-not-fat produced, and the following conclusions are drawn tentatively from the results obtained: "A variety in the ration of a dairy cow as used in this experiment has no influence upon the amount of milk produced nor upon its composition. A constant, palatable ration may be fed with less trouble, perhaps more cheaply, and with better results than one which is being constantly varied."

The influence of the nutritive ratio upon the economy of milk and butter production, H. HAYWARD (*Pennsylvania Sta. Rpt. 1902, pp. 321–396*).—The work here reported in detail consisted of 3 experiments, the first being made in 1896 and the last completed in 1899. Ten cows arranged in pairs and thus constituting 2 lots were used in each experiment, which was divided into 5 periods of about 40 days each. During the first and last periods all the cows, and during the intervening periods the 5 cows constituting lot 1 or the control lot, were fed a uniform ration. The other 5 cows, during periods 2, 3, and 4, received rations having varying nutritive ratios. In the first 2 experiments the digestible matter in the grain consumed

was computed from average analyses of feeding stuffs. In the third experiment th feeding stuffs were analyzed. The following table sumarizes some of the data for th three experiments:

Influence of the nutritive ratio upon milk production.

	Lot.	Nutritive ratio.	Total digestible nutrients consumed.	Daily yield of milk.	Daily yield of fat.	Daily yield of solids-not-fat.	Fat content of milk.	Cost of ration.	Profit from milk.	Protein eaten per pound of milk
Experiment I:			*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Per ct.*	*Cents.*	*Cents.*	*Lbs.*
Period 1	1	1:3.46	16.81	22.53	1.065	1.977	4.73	21.1	12.7	0.13
	2	1:3.55	17.91	22.31	1.087	1.986	4.88	21.9	11.6	.13
Period 2	1	1:3.46	16.82	19.61	.914	1.755	4.66	21.0	8.4	.16
	2	1:5.75	19.46	19.75	.936	1.815	4.74	20.8	8.8	.11
Period 3	1	1:3.36	16.82	17.59	.871	1.644	4.95	21.3	5.1	.18
	2	1:6.60	17.88	17.20	.867	1.643	5.04	20.3	5.5	.10
Period 4	1	1:3.57	17.17	16.40	.781	1.441	4.76	22.1	2.5	.19
	2	1:5.82	19.49	16.28	.810	1.480	4.98	21.5	2.9	.14
Period 5	1	1:4.05	17.07	15.43	.760	1.360	4.92	22.5	.6	.19
	2	1:4.05	17.72	15.10	.780	1.360	5.16	22.7	0.0	.19
Experiment II:										
Period 1	1	1:4.01	17.69	21.47	1.010	1.900	4.70	21.8	10.4	.13
	2	1:4.01	17.48	21.48	1.030	1.950	4.84	21.8	10.4	.13
Period 2	1	1:4.11	17.96	18.10	.820	1.590	4.53	21.9	5.2	.15
	2	1:5.96	17.56	18.66	.860	1.660	4.61	20.9	7.1	.11
Period 3	1	1:4.24	17.62	17.01	.760	1.480	4.47	21.9	3.6	.16
	2	1:7.78	17.13	17.44	.790	1.570	4.53	20.2	5.9	.09
Period 4	1	1:4.27	17.44	16.02	.730	1.400	4.55	21.9	2.4	.17
	2	1:6.25	17.12	15.53	.750	1.370	4.83	20.9	2.4	.13
Period 5	1	1:5.31	17.29	14.36	.670	1.260	4.66	21.9	— .4	.16
	2	1:5.31	16.97	13.12	.640	1.160	4.88	21.9	— 2.2	.18
Experiment III:										
Period 1	1	1:6.13	14.90	20.74	.970	1.820	4.68	19.8	11.3	.09
	2	1:6.12	16.27	18.90	.890	1.640	4.71	20.1	8.2	.09
Period 2	1	1:6.50	14.98	17.50	.800	1.520	4.57	19.8	6.4	.09
	2	1:8.50	17.57	17.10	.780	1.500	4.59	19.8	5.8	.08
Period 3	1	1:6.50	14.87	14.74	.690	1.250	4.76	19.8	2.3	.12
	2	1:11.3	16.58	14.28	.690	1.230	4.83	19.1	2.3	.07
Period 4	1	1:6.40	14.55	11.74	.600	1.090	5.07	19.8	— 2.2	.15
	2	1:8.30	15.85	13.02	.650	1.130	4.96	19.8	— .3	.10
Period 5	1	1:6.20	14.43	10.89	.520	.960	4.77	19.8	— 3.5	.16
	2	1:6.30	15.67	12.94	.650	1.160	5.05	20.1	— .7	.14

The author draws the following conclusions tentatively: "The nutritive ratio between the limits of 1:3.4 and 1:11.3 had no effect upon the quantity or quality o milk production. One and three-tenths pounds of computed digestible protein wa sufficient for a 1,000 lb. cow in full milk, the other conditions necessary to her wel fare being met. Within certain limits the quantity, digestibility, and palatability of the food, and its effect upon the animal's general system was of more importanc than the relative amount of digestible protein and carbohydrates the ration con tained. The individuality of the cows experimented upon is an important factor t be reckoned with in investigations of this kind. The term 'balanced ration' is very indefinite one and may be misleading."

Report of the assistant in dairy husbandry, C. B. LANE (*New Jersey Stas. Rpt 1902, pp. 291–327, pls. 9*).—Notes are given on the 12 kinds of forage crops grown for the dairy herd during the year, data as to yield, cost of production, etc., bein tabulated. The average yield of alfalfa for 5 years was 19.32 tons of green forage equivalent to 4.83 tons of hay per acre. The average cost of production was $26.5 per acre. Disking alfalfa proved beneficial. Of the several varieties of corn grown for forage the best yields were made by Monmouth White. Data are also given i tabular form for the different soiling crop rotations which have been practiced at th station. Conditions affecting the value of forage crops, such as stage of maturity palatability, influence upon the flavor of milk, etc., are briefly discussed.

During the period from May 1 to November 1, when soiling crops were fed, th average yield of the herd for 6 years was 3,457 lbs. of milk and 173.8 lbs. of butter

and during the other 6 months of the year, when silage was fed, the average yield was 3,050 lbs. of milk and 156 lbs. of butter. The use of nitrate of soda at the rate of 150 to 160 lbs. per acre was found to be profitable in the case of rye, wheat, and barnyard millet, and slightly unprofitable in the case of barley sown very late in the season. Liming proved beneficial in all the tests made.

Data concerning the fertilizing elements contained in the feeding stuffs purchased and in the milk produced by the dairy herd showed a decided gain to the farm during the 6 years in which dairying in relation to soil exhaustion has been studied.

Four cases of milk fever, with 3 recoveries following the Schmidt treatment, are reported.

The average cost of milk production for 6 years was 2.39 cts. per quart, which includes food, labor, and interest on and decrease in the value of the herd.

A monthly record of 22 cows for the year ended April 1, 1902, is given. The average yield of milk per cow was 6,671.1 lbs. and the average fat content of the milk was 4.22 per cent. The waste in handling and delivering milk during the year was 2 per cent, as compared with 10.8 per cent in 1897.

Dairy herd records, J. H. Grisdale and R. Robertson (*Canada Expt. Farms Rpts. 1902, pp. 63–72, 252, 253*).—Records for one year are given of 26 cows at the Central Experimental Farm and 22 cows at the Experimental Farm for the Maritime Provinces.

Tests of pure-bred cows, J. B. Lindsey (*Massachusetts Sta. Rpt. 1902, pp. 57–60*).—Seven-day tests of 10 Jersey cows are reported. Of the 133.38 lbs. of fat produced by the 10 cows, 128.59 lbs., or 96.41 per cent, was recovered in the manufactured butter. Analyses of 16 samples of the butter showed the following average composition: Water 14.03 per cent, fat 82.88 per cent, salt 2.45 per cent, curd 0.74 per cent.

Milking experiments, J. H. Grisdale (*Canada Expt. Farms Rpts. 1902, p. 70*).—Four experiments to determine the effect upon the yield and quality of milk of milking cows at unequal intervals are briefly summarized. The results are considered as indicating that—

"(1) Slight inequalities in the intervals between milkings do not affect the average percentage of fat in the daily yield of milk, nor the average daily yield of milk.

"(2) Very considerable inequalities in the intervals between milkings would appear to affect slightly both the quantity and quality of the milk produced, the quantity being reduced and the quality somewhat inferior. The amount of butter fat in 100 lbs. of milk seemed to be reduced by about 3½ per cent.

"(3) Very considerable inequalities in the intervals between milkings affected the amount of milk and the percentage of fat in the milk at the different milkings. The amount of milk after the long interval was much greater than that yielded after the short interval, but the percentage of butter fat in the milk after the long period was much lower than the percentage of fat in the milk after the short interval.

"(4) On the whole, it would appear that inequalities in the intervals between milkings need arouse no anxiety as to their effect upon the quantity or quality of the product, provided no considerable sudden changes are made."

The bacterial contamination of milk, F. C. Harrison (*Rev. Gén. Lait, 2 (1903), Nos. 20, pp. 457–463; 21, pp. 481–489; 22, pp. 510–519; 23, pp. 538–546*).—The author discusses the infection of milk by bacteria contained in the udder and contamination from the exterior of the animal, from the milker, from the air of the stable, and from dairy utensils, reviewing considerable literature to which references are appended, and reporting briefly the results of experiments conducted by himself. The experiments relating to the bacterial flora of freshly drawn milk have been noted from another source (E. S. R., 14, p. 907).

In the author's experience the use of a milking machine greatly increased the bacterial content of the milk. The purification of milk by centrifugal separation was investigated. The bacterial content of the cream and skim milk mixed after separation was greater than that of the milk before separation in 21 out of 30 experiments.

The number of liquefying bacteria was largely increased by separation. The results tend to show that this method of purification, so far as bacteria are concerned, is ineffectual.

From 12,000 to 42,000 bacteria per minute were deposited in a 12-in. pail during bedding, while only 400 to 2,000 were deposited per minute 1 hour after this operation. From 215,000 to 806,000 bacteria per cubic centimeter were found in the washings of cans poorly cleaned, from 15,000 to 93,000 in the washings of cans washed in tepid water and then scalded, and from 300 to 1,800 in the washings of cans washed in tepid water and then steamed for 5 minutes.

Bacteria in normal milk and their relation to the ripening of cheese, E. von Freudenreich and J. Thöni (*Landw. Jahrb. Schweiz, 17 (1903), No. 3, pp. 234–246; Ann. Agr. Suisse, 4 (1903), No. 4, pp. 215–229; Rev. Gén. Lait, 2 (1903), Nos. 11, pp. 241–247; 12, pp. 271–280*).—Studies were made of the milk of 15 cows to determine the number and species of the bacteria present. The milking was done with the utmost care to prevent contamination, and gelatin plate cultures were made immediately, one drop of the milk from each quarter of the udder being used in separate cultures. Whey-agar stab cultures were also made for the purpose of determining the presence or absence of lactic-acid bacteria.

The experiments were made in March, 1902, and repeated in April. As regards the total number of bacteria great variations were observed with the different cows and with the different quarters of the udder of the same cow. The species consisted practically of micrococci and a nonliquefying Bacterium. Lactic-acid bacteria were invariably absent. The micrococci consisted of both liquefying and nonliquefying forms, of which the nonliquefying seemed on the whole to predominate. As the nonliquefying micrococci as well as the nonliquefying Bacterium disappear early in cheese, these organisms were not studied. The liquefying micrococci were grouped according to their morphological and cultural characters into 4 types, some of which included several varieties. The different forms are described, as is also a rapidly liquefying Bacterium isolated from cheese.

Numerous small experimental cheeses were made in order to study the influence of the different liquefying organisms. The milk used for this purpose was obtained with great care and contained on an average 104 bacteria per cubic centimeter. Bacteriological and chemical examinations were made of the cheeses 7 days after making and again at the end of 5 or 6 months. As in earlier experiments, cheeses made without the addition of cultures showed almost no ripening. The best results were obtained by the use of a liquefying micrococcus isolated from Emmenthaler cheese and closely resembling a micrococcus isolated in one or two instances from milk. The results with the micrococcus isolated from milk were favorable as regards the taste of the cheese, and a further study is to be made of this organism. The other organisms isolated from milk rendered the casein soluble to a greater or less extent, but the cheeses inoculated with them did not undergo normal ripening.

The micrococcus isolated from cheese is believed to be the only one of importance in the ripening of Emmenthaler cheese, and the rôle here played is that of rendering the casein soluble, making it more assimilable to the lactic-acid bacteria which later predominate and which are the principal agents in cheese ripening.

The presence of bacteria in the cow's udder, E. von Freudenreich (*Landw. Jahrb. Schweiz, 17 (1903), No. 3, pp. 201–222; Ann. Agr. Suisse, 4 (1903), No. 4, pp. 185–206; Rev. Gén. Lait, 2 (1903), Nos. 16, pp. 361–370; 17, pp. 385–394; 18, pp. 40[illegible]–417*).—Following a review of the literature of this subject bacteriological examinations of the udders of 15 cows are reported. Gelatin cultures were made, using portions of glandular tissue from each half of the udder, pieces of mucous membrane from each milk cistern, and in some cases milk obtained from the milk ducts or the glandular tissue. The material for inoculation was obtained in most cases immediately after the death of the animal and with great care to prevent contamination

Bacteria were found in cultures from each of the udders examined. The possibility of air contamination as accounting for this result was excluded by a series of control experiments in which pieces of sterilized paper were used in place of the animal tissue, the results showing no infection, and by the conditions and results of the experiments as a whole. The number of bacteria varied greatly in the different udders and was highest in the two which were not examined until the morning following the evening on which the animals died, showing marked bacterial development overnight. Plates exposed for from 10 to 45 minutes to the air of the laboratory, in which the examinations were made, developed only 10 to 50 colonies, showing an insufficient number in the air to account for the results. The cultures did not show the diversity of forms to be expected from air contamination. Moreover, it was necessary to heat the gelatin to 37° C. in order to secure the liquefaction of the gelatin and the penetration of the tissues in order to obtain a strong inoculation, which would not have been the case had the bacteria been confined solely to the exterior of the piece of tissue.

The bacteria found were almost always liquefying and nonliquefying micrococci. Occasionally, however, a nonliquefying Bacterium was present, and in 2 instances other species, believed to be due to accidental infection, were met with. In 3 cases portions of the udder showed morbid changes, cultures from which, contrary to expectation, showed a low content of bacteria. In the udders of 3 cows, which had not been milked for several weeks, fewer bacteria were present than usual. The bacteria were apparently incapable of indefinite multiplication in the udder.

The source of the bacteria in the udder was studied. *Bacillus prodigiosus* injected into the teat of a goat was recovered in the milk during the 8 days following. Three days after a second injection the goat was killed and the bacillus was found in the glandular tissue. *B. fluorescens* similarly injected was not recovered. While not so numerous as in the mammary gland, bacteria were also found in the normal kidney and spleen, indicating an infection through the blood. The evidence so far obtained is not considered sufficient to decide whether the infection of the mammary gland is hematogenous or results from an invasion by way of the milk ducts. It is suggested that perhaps the infection is produced in both ways.

Studies concerning the so-called germicidal action of milk, H. W. Conn and W. A. Stocking (*Rev. Gén. Lait, 2 (1903), Nos. 12, pp. 265–271; 13, pp. 298–304*).—The authors do not consider that the decrease frequently observed in the total number of bacteria in milk during the first few hours after milking is due to a germicidal action possessed by the milk, but believe that certain species of bacteria, finding milk an unsuitable medium for growth, disappear more or less rapidly, and that when such species are more numerous than those finding milk a suitable medium a decrease in the total number of bacteria may result. Evidence is presented in support of this view, to which reference has previously been made (E. S. R., 14, p. 533).

The physical constitution of the fat globules of milk, M. Beau (*Rev. Gén. Lait, 2 (1903), Nos. 15, pp. 341–350; 16, pp. 372–378; 17, pp. 395–399; 18, pp. 417–424; 19, pp. 441–448*).—This is an exposition of the different theories which have been advanced, the evidence in support of each being reviewed in detail.

Contribution to the study of churning, M. Henseval and L. Marcos (*Rev. Gén. Lait, 2 (1903), Nos. 20, pp. 463–469; 21, pp. 489–499; 22, pp. 519–524*).—The theory of churning is discussed and experiments relating to the influence of temperature and rapidity of churning, richness of cream, acidity, and pasteurization are reported. The temperature and number of revolutions were varied in churning 3 lots of the same cream. With 60 revolutions and an initial temperature of 11° C. the time required for churning was 58 minutes and the final temperature was 14.2°. With the same number of revolutions and an initial temperature of 14° the time required was 34 minutes and the final temperature was 15.2°. With 80 revolutions and an initial temperature of 10° the time required was 62 minutes and the final

temperature was 13.5°. The number of revolutions per minute is therefore shown to be an important factor in churning, a high number compensating to a certain extent for a low temperature.

Two churning experiments were made with cream containing different percentages of fat. The loss of fat in the buttermilk from rich cream was greater than that in the buttermilk from cream less concentrated. Taking into account, however, the difference in the volume of milk furnishing the cream, the results are stated to be more favorable to the rich cream. Less time was required in churning the rich cream. When sweet cream was used the butter from rich cream was considered superior in quality, but when ripened cream was churned the results were reversed.

In churning experiments with sweet cream pasteurization increased the yield of butter by increasing its water content, the loss of fat being, however, somewhat greater than that from unpasteurized cream. Pasteurization notably decreased the time required for churning. The butter from pasteurized cream was considered better as regards quality and keeping properties. Ripened cream as compared with sweet cream churned more exhaustively and in less time.

The percentage of water in Canadian creamery butter, F. T. Shutt (*Canada Expt. Farms Rpts. 1902, pp. 164, 165*).—This is a summary of the report previously noted (E. S. R., 14, p. 908).

Execution of the dairy law, J. B. Lindsey (*Massachusetts Sta. Rpt. 1902, pp. 54–56*).—Of the 2,344 pieces of glassware tested during 1902, 56 pieces or, 2.4 per cent, were found incorrect. The limits of error allowed in testing are given. The inspection of Babcock machines in 1901 showed 20 machines to be in good condition, 11 to be in need of repairs, and 9 to be entirely unfit for satisfactory work. The inspection in 1902, while not completed, showed a marked improvement.

VETERINARY SCIENCE AND PRACTICE.

Proceedings of the American Veterinary Medical Association for 1902 (*St. Paul: Pioneer Press Co., pp. 346, pl. 1, figs. 9*).—The thirty-ninth meeting of the association was held in Minneapolis, Minn., September 2–5, 1902. A number of papers were read at the various sessions of the association. The majority of these papers have already been noted (E. S. R., 14, pp. 200–202). The other papers will be briefly referred to in this connection.

The pathogenesis of equine pneumonic emphysema, A. H. Baker (pp. 155–158).—This disease is said to be on the increase in both the eastern and western portions of the country. The majority of cases are due to faulty dietetics. The results of the disease may vary from slight injury to total uselessness of the horse. In the treatment of the disease the author recommends that attention be given to securing clean hay and grain.

The care and Comfort of domestic animals under varying conditions, E. A. A. Grange (pp. 206–211).—Attention is called to a number of unfavorable conditions to which driving and draft horses are subjected through neglect. It is urged that trained veterinarians should undertake investigations on various problems connected with the proper care and protection of animals from rain and excessive cold or heat as well as any other unfavorable conditions.

Equine periodic ophthalmia, M. Jacob (pp. 212–216).—The author made a study of this disease with special reference to the extent of its distribution, the age at which horses and mules are most frequently affected, the nature of the disease, and the line of treatment. The disease was found to be most prevalent in April, and it is believed that it is transmitted in the food, water, soil, and possibly in the air. This form of opthalmia is most prevalent in Tennessee and Kentucky. It appears that the left eye is more frequently affected than the right. The best results in treatment were obtained from the use of Lugol's solution.

A pathological and symptomatic treatment of parturient paralysis, R. P. Lyman (pp. 234–242).—Detailed notes are given on the clinical symptoms and treatment of 18 cases of this disease. The author discusses briefly the etiology of this disease and the nature of treatments which have been generally recommended. In a number of cases hypodermic injections of strychnin in doses of $\frac{1}{8}$ gr. were given every 2 hours, with excellent results. The strychnin treatment may be combined, or not, with Schmidt's treatment, according to circumstances. The results obtained by the use of strychnin were so satisfactory that the author feels justified in continuing it.

The legitimate field of the American Veterinary Medical Association, R. R. Bell (pp. 243–248).—A brief discussion of the nature of the papers to be read and the other work to be performed at the meetings of the association. The author believes that the papers should be on as wide a variety of subjects as possible in order to make the meetings of interest to all veterinarians, and that clinics should be held in connection with each meeting.

Parasitic ictero-hematuria of sheep, M. E. Knowles (pp. 277–281).—The author briefly discusses the nature and symptoms of this disease, which has been reported as existing in the Deer Lodge Valley since 1891, and which appears to be of considerable economic importance in that locality. In connection with this paper a portion of an article by V. Babes on the same subject was also presented.

Annual report for 1901 of the principal of the Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 248–266*).—The number of cases of rabies in England gradually diminished until the disease appeared to be exterminated in 1900. In 1902, however, a few cases occurred, which seems to indicate that rabies still exists in England, although within restricted limits. During the year 647 outbreaks of anthrax occurred. Glanders prevailed to a considerably increased extent, there being 1,350 outbreaks, with only 2,332 cases. The causes of the increase in glanders infection have not been carefully worked out. The latest outbreak of foot-and-mouth disease was stamped out during the year 1901. Experiments with intravenous injections of corrosive sublimate showed that this remedy is of no value in cases of foot-and-mouth disease of the malignant type.

Hog cholera appeared during the season to a greater degree than for several years, 3,140 outbreaks being reported. The author summarizes his investigations of this disease as follows: Every pig which is susceptible to cholera is capable of spreading the disease; the disease may also be carried from place to place in the excrement of infected pigs or upon other materials which have come in contact with such pigs. It is recommended that all pigs which have been exposed should be quarantined for some time on account of the fact that decided symptoms may not appear at once.

Notes are given on the prevalence of tuberculosis, the sterilization of tuberculous milk, and the immunization of cattle against tuberculosis. Experiments in producing immunity against tuberculosis have been made by the author on 3 cattle, 1 being treated with tubercle bacilli from the liver of a fowl, the second from the liver of a tuberculous pheasant, while the third case was tuberculous at the beginning of the experiment. These experiments indicated that a high degree of immunity against tuberculosis could be conferred on cattle. The immunity was not absolute and the author does not claim that his experiments foreshadow a practical method of vaccinating cattle on a large scale against tuberculosis.

Differential diagnosis of certain pathogenic bacteria, W. Omeliansky (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), No. 1, Orig., pp. 1–6*).—The author describes technical methods by which a number of pathogenic organisms, including anthrax and diphtheria bacilli, can be differentiated through the use of alkaline reactions and a number of fatty acids, especially formic acid.

Further investigations of Klein's pathogenic yeast, E. Cohn (*Centbl. Bakt. u. Par. 1., Abt., 33 (1903), No. 9, Orig., pp. 688–696, pls. 2*).—The author continued his studies of this organism, which has been shown to be exceedingly pathogenic for

mice and other experimental animals, including dogs. Detailed notes are given on the stainability of the yeast and on the nucleus, capsule and other morphological features of this organism. The yeast produces very different effects on different animal tissues. In the liver of mice the yeast cells were found quite unattended by pathological processes, while in the lungs of the same animals the inflammatory processes were quite conspicuous and tissue destruction was well marked in the alimentary tract of guinea pigs. Quite frequently also granulation tumors were produced. Experiments were made to determine the possibility of immunizing mice against the yeast. Mice which were treated with hypodermic injections of serum obtained from inoculated animals were later inoculated with virulent cultures; in some cases the progress of the disease was slightly delayed, but the immunizing effects were not marked in any case. No agglutinin or precipitin appeared to be developed in the immune serum.

A new acid-fast Streptothrix pathogenic to man and animals, C. Birt and W. B. Leishman (*Jour. Hyg.* [*Cambridge*], *2* (*1902*), *No. 2, pp. 120–128, pl. 1*).—The organism studied by the authors was isolated from a human patient, and during the further studies devoted to it many inoculations were made in experimental animals. It was found to be fatal to guinea pigs when inoculated in the peritoneum, within a period of from 5 to 6 weeks. Notes are given for the purpose of furnishing a differential diagnosis between this and related species.

The absorption of tetanus toxin, V. Morax and A. Marie (*Ann. Inst. Pasteur, 17* (*1903*), *No. 5, pp. 335–342*).—The authors previously noted the affinity of nerve tissue for the toxin of tetanus. Further experiments were made for the purpose of testing the absorption of this toxin by nerve fibers of different function. During these experiments dogs, ponies, and monkeys were used. It was found that the motor, sensory, and vasomotor fibers of the spinal nerves are equally concerned in the absorption of the tetanus toxin. The amount of toxin absorbed by different kinds of nerve fibers in different portions of the body depends somewhat upon the blood circulation and upon the distance of the part in question from the point of inoculation.

The heredity of albinism, W. E. Castle and G. M. Allen (*Proc. Amer. Acad. Arts and Sci., 38* (*1903*), *No. 21, pp. 601–622*).—A number of experiments were made in the investigation of the subject in the zoological laboratory of Harvard University. The experimental animals were mice, guinea pigs, and rabbits. The authors conclude as a result of their experiments that complete albinism behaves as a recessive character, and therefore occurs in accordance with Mendel's law.

Report on animal diseases, H. Mitchell (*New Jersey State Bd. Agr. Rpt. 1902, pp. 171–174*).—A brief account of anthrax, glanders, rabies, and tuberculosis, showing the number and location of cases of these diseases.

Inspection of cattle in Argentina (*U. S. Consular Rpts., 72* (*1903*), *No. 27[illegible], pp. 124, 125*).—Brief notes on the terms of a convention with Uruguay with regard to sanitary inspection of live stock.

Dangers of eating meat from abattoirs and means of avoiding them, E. M. Serrano (*Gac. Med. Zool., 26* (*1902*), *No. 3–7, Sup., pp. 72*).—A series of lectures delivered at the Spanish Hygienic Society. Dangerous meat is divided into 4 classes, viz, meat infested with bacteria or parasites, meat which has undergone alterations and is unusually susceptible to putrefaction, meat which has undergone alterations so as to render it repulsive, and viscera which exhibit bacterial or parasitic lesions which are transmissible to man. Notes are given on the most approved methods of inspecting the meat for the purpose of detecting these various dangerous conditions.

The virulence of tubercle bacilli in pure cultures from tuberculous foci in man, E. Krompecher and K. Zimmermann (*Centbl. Bakt. u. Par., 1. Abt., 33* (*1903*), *No. 8, Orig., pp. 580–607*).—The recent literature bearing on this subject is critically discussed in connection with a short bibliography. The author's experiments were

undertaken for the purpose of studying the variations in virulence in tubercle bacilli of human origin. It was found in making pure cultures from this material that success was to be expected only in cases where the tubercle bacilli were not associated with other organisms. In cases of mixed infection the other organisms appear to check the development of the tubercle bacilli. In 86 per cent of cases of surgical tuberculosis in man success was had in cultivating the bacilli from the material thus obtained. It was found that from material which contained but very few isolated tubercle bacilli cultures could easily be made on a 5 per cent glycerin-potato medium. This method proved a more successful test for the presence of tubercle bacilli than inoculation experiments with animals. The variations in color of different cultures from yellowish to red or blackish brown are considered as due largely to the composition of the medium rather than to the differences in virulence of the bacilli. Great differences are observed in the development of the disease in rabbits of the same weight inoculated with equal doses. These differences are ascribed strictly to variations in individual susceptibility. Generalized tuberculosis was produced in rabbits within from 30 to 40 days after intravenous inoculation with from 0.25 to 10 mg. of material obtained from pure cultures of human origin. The authors call attention to the danger of ascribing the differences in the lesions found in different animals to differences in virulence of the bacilli concerned. It is believed to be safer to ascribe this phenomena to differences in individual resisting power and susceptibility. Tubercle bacilli which were subjected to the action of iodoform were found not to lose their virulence to any appreciable extent.

A method of testing the agglutination of tubercle bacilli, A. Köppen (*Centbl. Bakt. u. Par., 34 (1903), No. 1, Orig., pp. 6–13*).—Some of the more important literature on this subject is briefly criticised. The author argues that great care should be exercised in preparing sera for testing agglutination, in order that one may be sure that the result is a true agglutination and not a mere chemical precipitation.

Report of commission on tuberculosis in animals, F. Dye (*New Jersey State Bd. Agr. Rpt. 1902, pp. 161–168*).—The State has increased the amount of appropriation for carrying on the work of suppressing tuberculosis. The commission appointed for this purpose is investigating dairy herds and other herds in which outbreaks of tuberculosis are reported. The average indemnity price paid for diseased cattle was $22.79. Notes are also given on the application of the tuberculin test.

Combating tuberculosis in Denmark, E. Power (*Jour. Agr. Prat., n. ser., 5 (1903), No. 18, pp. 574–576*).—The system of governmental control of bovine tuberculosis in Denmark has been gradually perfected since 1893, and the many beneficial results which have been brought about by this system are briefly described by the author.

Tuberculosis and the use of tuberculin, W. Robertson (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, pp. 528–539, pls. 2*).—The author mentions the animals which are most susceptible to tuberculosis and briefly describes the natural channels of infection with this disease in cattle. Notes are also given on the symptoms and pathological lesions, and on the comparative frequency of the invasion of different parts and organs of the body. The nature of tuberculin is discussed, and directions are given for making tuberculin tests and for keeping herds of cattle free from tuberculosis.

The occurrence of tubercle bacilli in the milk of reacting cows, O. Stenström (*Ztschr. Thiermed., 6 (1902), No. 4, pp. 241–257*).—In experiments reported in this paper the author sought to determine the stage which tuberculosis must reach in cattle before the milk becomes infectious. Some of the cows from which the milk was obtained were affected with latent tuberculosis, while others were diseased to such an extent as to present clinical symptoms. None, however, were affected with the mammary form of the disease. Rabbits and guinea pigs were used for the experimental animals. In all 83 inoculations were made with the milk from these

cows, and in not a single case did the milk prove to be virulent. The author states, however, that in spite of the fact that all of these experiments and the majority of those of other investigators tend to show that the milk of tuberculous cows not affected with the mammary form is not virulent, tubercle bacilli occur from time to time in the milk of such cows. It is suggested that the chief means by which tubercle bacilli gain entrance to milk is from uncleanliness in milking and from the failure to detect mammary tuberculosis.

Observations on abortion and tuberculosis in cattle, J. Nelson (*New Jersey Stas. Rpt. 1902, pp. 370–374*).—Notes are given on the temperature reactions and post-mortem findings in a number of tuberculous cows which were slaughtered during the year. Some of these animals had been subjected to 20 injections of tuberculin, but this treatment, while perhaps prolonging the course of the disease, did not prevent its slow development.

Do Koch's recent assertions justify a change of attitude toward bovine tuberculosis? Dammann (*Jahrb. Deut. Landw. Gesell., 17 (1902), pp. 34–44*).—The author reviews in a critical manner the literature relating to the controversy concerning the unity or duality of the tubercle bacillus. It is concluded from this discussion that the dual nature of tubercle bacillus is not demonstrated and that sanitary precautions should therefore be strictly observed in dealing with the meat and milk of tuberculous animals.

Remarks on Veszpremi's "Differences in virulence of different cultures of tubercle bacilli," K. Vagedes (*Centbl. Bakt. u. Par. 1. Abt., 33 (1903), No. 9, Orig., pp. 679, 680*).—A controversial article in which it is pointed out that while the results claimed by the 2 investigators differ to some extent, they agree in indicating that tubercle bacilli of different origin may exhibit considerable differences in virulence.

The prospects for the prevention of Texas fever and the tsetse-fly disease, R. Endlich (*Tropenpflanzer, 6 (1902), No. 6, pp. 269–285*).—The author presents a brief critical account of the work thus far accomplished in connection with the study and prevention of Texas fever in the United States and elsewhere. Notes are also given on the work of Koch and other authors in the control of tsetse-fly disease.

The prevention of the tsetse-fly disease and its economic importance, Schilling (*Tropenpflanzer, 6 (1902), No. 12, pp. 616–625*).—Attention was called to the great need of draft oxen and horses in the Togo District of South Africa and to the rudimentary condition of soil cultivation. The prevalence of the tsetse-fly disease is believed to be of great importance in determining the backward state of agricultural science in that country and the problem of its eradication is shown to be of great importance.

Directions for using vaccine for the prevention of blackleg in cattle, L. L. Lewis (*Oklahoma Sta. Bul. 57, pp. 15, figs. 3*).—The Oklahoma Station has been distributing vaccine to farmers for a number of years, the total number of doses being about 278,000. The vaccine is distributed free upon application of any stock raiser. Suggestions are given regarding the methods of vaccinating animals and a brief discussion is presented on the symptoms of blackleg. It has been found best to vaccinate young animals at least twice, and 3 times if they are vaccinated before 6 months of age. Vaccination of young calves does not furnish protection for any great period.

Notes on an outbreak of cattle plague in Shanghai and its limitation by the gall immunization of Koch, A. Stanley (*Jour. Hyg. [Cambridge], 2 (1902), No. 1, pp. 43–46*).—An outbreak of this disease occurred in Shanghai and spread from herd to herd despite the efforts of the police to control it. It was therefore resolved to apply Koch's method of immunization with gall. Gall bladders of cattle just dead of the disease were removed under antiseptic conditions and bile obtained from them was inoculated into the dewlap of healthy cattle in doses of 20 cc. During these experiments 68 cattle were injected with gall. In all, 11 of these animals died, but only 1 under conditions which precluded an infection previous to the vaccina-

ion. The method is regarded as inexpensive and easily applied and also as of great fficiency.

Sulphate of iron as a preventive of foot-and-mouth disease, G. TEISANU *Jour. Agr. Prat., n. ser., 5 (1903), No. 17, p. 538).*—This remedy was used as a wash n preventing a contagion of foot-and-mouth disease during an outbreak of this plague. The animals thus treated did not develop the disease.

Tympanites, E. RUHVEDEL (*Jour. Khediv. Agr. Soc. and School Agr., 4 (1902), No. 5, pp. 189, 190*).—Brief notes on tympanites as caused by feeding on berseem and other related plants. The usual remedies for this affection are recommended.

Tests of fly preventives, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1902, pp. 61–63*).—A test was made of a number of proprietary remedies for keeping flies away from cattle and horses. These remedies included Sure Thing, Cattle Comfort, Stop Fly, Norwood Sanitary Fluid, Flylene, Shoo Fly, Eli Fly Chaser, Eureka, Rippley's Fly Remover, and Cypher's Anti-Fly Paste. The results obtained from the use of these remedies on cattle and horses indicate that while a number of the preparations are quite efficient in keeping the flies away from the animals, the cost is so great as to be almost prohibitive.

Some diseases of sheep, T. W. CAVE (*Jour. Southeast. Agr. Col. Wye, 1903, No. 12, pp. 86–95*).—Notes on a number of bacterial and parasitic diseases, including tetanus, gid, and tapeworms, together with an account of blackleg, which is referred to in parts of England under the term "struck." Attention is called to the desirability of exercising antiseptic precautions in the prevention of tetanus. For reducing the prevalence of gid it is necessary to destroy the heads of infested sheep in order that they may not be eaten by dogs.

Heartwater in sheep and goats, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 22 (1903), No. 4, pp. 838–843*).—A method of vaccination against this disease was devised by Dr. Purvis, and the veterinary department of Cape Colony was questioned regarding the value of this system of vaccination. A test by the department indicated that the method was no more efficacious than that in use by the department veterinarians. Notes are given on the special facts which have been demonstrated in connection with the etiology and treatment of this disease.

Scab in sheep, D. E. SALMON and C. W. STILES (*U. S. Dept. Agr., Farmers' Bul. 159, pp. 48, figs. 17*).—A condensed form of Bulletin 21, revised, of the Bureau of Animal Industry (E. S. R., 10, p. 793).

Some of our commoner local internal parasitic diseases of sheep, W. H. DALRYMPLE (*Louisiana Stas. Bul. 74, 2. ser., pp. 216–231, figs. 2*).—The sheep botfly sometimes occurs in such large numbers as to cause a great irritation and loss of flesh. The author found 42 larvæ of this insect in a single sheep. Notes are given on the adult and larval condition of the insect and on the symptoms produced by its presence in the nasal passages of the sheep. The remedies recommended are largely preventive and include smearing tar or fish oil upon the nose of the sheep, together with the destruction of the heads of infested sheep after slaughter. A brief account is also given of *Tænia expansa*—the common tapeworm of sheep—and on the stomach worm (*Strongylus contortus*). The author discusses the habits and life history of these species.

Especial attention was devoted to a study of the nodular disease of sheep, due to the presence of *Œsophagostoma columbianum* in the walls of the intestines. These worms are so protected by their position that direct remedies are of little avail. The only means of checking their spread is found in the adoption of preventive measures. Experiments were made for the purpose of determining whether pastures may be readily infected by the presence of sheep infested with this parasitic worm. It was found that sheep affected with nodular disease, when placed on a clean pasture, readily infected this land with the parasites which cause the disease. Healthy lambs when allowed to graze upon such land soon became affected from this exposure.

Brief suggestions are made with regard to a practical method by which healthy lambs may be obtained from diseased ewes.

Parturient paresis in sows and its treatment according to Schmidt's method, K. Egeberg (*Norsk. Vet. Tidsskr., 15 (1903), No. 1, pp. 29, 30*).—The author describes the symptoms observed in cases of this disease in sows. In one instance a test was made of the recent method of treatment, which consists in pumping air into the udder. The symptoms were relieved within a short time and complete recovery took place.

Mal de caderas, M. Elmassian and E. Migone (*Ann. Inst. Pasteur, 17 (1903), No. 4, pp. 241–267, figs. 4*).—This disease is due to the presence in the blood of the protozoan organism known as *Trypanosoma equina*. This organism is described in detail and notes are given on the most approved methods for fixing, staining, and studying it. Mal de caderas occurs in a number of clinical forms, the more common of which runs a tolerably rapid course. The disease also occurs in chronic and paralytic forms.

Notes are given on the symptoms that are characteristic of these different forms and upon the pathological lesions which are produced during the progress of the disease. The liver, spleen, and pancreas become much injected and swollen, while the lymphatic system is not affected. In addition to the horse, mule, and ass, which are most susceptible to the disease, a number of other animals may be infected, and the susceptibility of these animals varies from that observed in monkeys to the absolute refractoriness of birds. Aside from the horse tribe, the susceptible animals are as follows: Monkey, white and gray mice, white rat, capibara, guinea pig, rabbit, dog, sheep, cattle, pig.

A study of the disease of South American horses known by the name of mal de caderas, J. Lignières (*Contribution à l'étude de la trypanosomose des équidés Sud-Americains connue sous le nom de "mal de cadera." Buenos Aires: 1902, Coni Brothers, pp. 120, pls. 3*).—The author reviews in a critical manner the literature relating to this disease. Notes are given on the microscopical structure of *Trypanosoma elmassiani*, which is the causative organism of the disease. The author discusses also the method of multiplication of this organism, its abnormal forms, and the effect of various sera in agglutinating it.

In a long series of experiments it was found that agglutination of the pathogenic organism of mal de caderas could be brought about by the sera of normal sheep, pigs, rabbits, and horses, but more effectively by the sera of cattle, sheep, dogs, and cats affected with mal de caderas. As a rule agglutination took place immediately, and then became more pronounced by a gradual process. The organism of mal de caderas when subjected to a temperature of 53° C. for 5 minutes or 45° for 8 minutes was killed. It withstood a temperature of 44° C. for 5 minutes, but was destroyed by the same temperature when applied for a period of 15 minutes. Subjection to a temperature of −20° for 5 minutes destroyed a considerable percentage of the trypanosoma.

Experiments were also made with a number of antiseptic substances, such as carbolic acid, lysol, boric acid, corrosive sublimate, and permanganate of potash. In general the antiseptics had the effect of causing agglutination. This process was most pronounced after the use of potassium permanganate. An extensive series of inoculation experiments showed that a large number of animals are susceptible to this disease. The susceptible animals according to the author's experiments, mentioned in the order of their susceptibility, include white mouse, white rat, gray mouse, gray rat, dog, horse, rabbit, cat, sheep, cattle, dog, pigeon, duck, domestic fowl, and frog. The method of infection by this disease has not been determined. The author suggests the possibility of the organism being carried by *Stomoxys calcitrans*. The blood of infected animals when taken from the stomach of this species of fly was found to contain the organism of mal de caderas in a virulent condition.

Horse sickness, investigation, H. W. PITCHFORD (*Agr. Jour. and Min. Rec., 6 (1903), No. 8, pp. 249–257*).—The author continues an account of his studies on the etiology of South African horse sickness. It is believed that some flying insect, probably a mosquito, is the carrier of infection. Horses kept in stables in which smudges were maintained appeared to be protected against the disease, and the author interprets this fact as due to the effect of smoke upon mosquitoes.

Notes on the mallein test, G. FEIST (*Fortschr. Vet. Hyg., 1 (1903), No. 1, pp. 30–33*).—Attention is called to the difficulties experienced by official veterinarians in satisfying the minds of horse owners as to the diagnosis of glanders. Notes are given on 286 cases in which the mallein test was made; among these horses 26 reacted and were found to be glanderous upon post-mortem examination. In the author's experience no case was observed in which a glanderous horse failed to react, and no reaction was produced in horses which were not glanderous.

The pathological importance of botfly larvæ in the stomach of horses, E. PERRONCITO (*Fortschr. Vet. Hyg., 1 (1903), No. 1, pp. 40–43*).—A number of cases have been reported in the literature of this subject in which the stomach wall was more or less injured by the presence of botfly larvæ. The author believes that the attacks of these insects brings about greater susceptibility to colic and infectious diseases.

Insects which may aid in the spread of surra, J. C. KONINGSBERGER (*Teysmannia, 13 (1902), No. 6, pp. 314–322*).—On account of the resemblance in symptoms of surra and nagana the author believes that the former disease may be conveyed in Java by some species of fly, as nagana is transmitted by the tsetse fly in South Africa. Descriptions are given of several species of biting and sucking insects which might be suspected of being carriers of surra.—H. M. PIETERS.

Natural immunity of dogs and chickens to anthrax, A. PETTERSSON (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 8, pp. 613–626*).—During the author's experiments on this subject it was found that the serum obtained from chickens possessed essentially the same resisting powers toward anthrax as that obtained from dogs. The dog, however, is preferred in experiments of this sort for various reasons.

A number of experiments were made by the auther for the purpose of determining the properties of dog serum, especially in its reactions toward anthrax bacilli and with regard to the stimulating effect upon the dog serum of serum from rabbits previously treated with dog serum. It was found that rabbits which were treated with the serum of dogs developed substances antagonistic to both the amboceptor and the complement. Cytolytic immune bodies were produced by previous treatment of the animals with cellular secretions.

Rabies in South Africa, A. LOIR (*Ann. Inst. Pasteur, 17 (1903), No. 4, pp. 298–302*).—The author presents a brief description of an outbreak of rabies which occurred in Rhodesia. On account of the seriousness of the outbreak as observed by the author it was recommended that all dogs be muzzled and that all suspected dogs and other animals be killed. As a result of the investigation 80,000 dogs were killed. A number of experiments were made on rabbits for the purpose of determining the virulence of rabies virus as obtained from various cases.

Antirabies vaccine at the Pasteur Institute in 1902, E. VIALA (*Ann. Inst. Pasteur, 17 (1903), No. 5, pp. 365–368*).—A table is given showing the number of persons treated and the mortality in these cases from 1886 to 1902, inclusive. The author discusses briefly also the history of the rabid animals concerned in these cases.

The histology of rabies corpuscles in the peripheral nerve ganglia, V. F. OTTE (*Ucher. Zapiski Kazan. Vet. Inst., 20 (1903), Nos. 2, pp. 237–245; 3, pp. 388–404, pl. 1*).—The microscopical structure of these corpuscles was carefully studied by the author and is described in detail.

An explanation of the occurrence of distemper among cats in the government of Kazan, in connection with the distribution of cultures of mouse typhus, A. N. ALEKASYEEV (*Uchen. Zapiski Kazan Vet. Inst., 20 (1903), Nos. 2, pp. 128–210; 3, pp. 251–314*).—The author made an exhaustive study of a number of outbreaks of distemper among cats which occurred coincidently with the distribution of mouse typhus cultures in the Province of Kazan. The literature of the subject is critically reviewed in connection with a brief bibliography. It is believed as a result of the author's studies that cats may be affected with a disease resembling distemper in all respects and may die as a result of eating mice which are infected with typhus. As a rule, however, it is believed that the distribution of mouse typhus cultures and the occurrence of distemper in cats are merely coincident and are not associated as the result of an infection of one animal by another. A number of organisms were isolated from cats which were affected with distemper.

The need of legislation relative to diseases of domestic animals, H. B. McDOWELL (*Delaware State Bd. Agr. Rpt., n. ser., 1901–2, pp. 43–49*).—Attention is called to the necessity of further legislation, especially in the control of anthrax and tuberculosis. It is said that at present the conditions are very favorable for the spread of anthrax in Delaware, on account of neglect of precautions which could easily be taken.

First aids to injured and sick animals, H. B. McDOWELL (*Delaware State Bd. Agr. Rpt., n. ser., 1901–2, pp. 57–63*).—Brief notes on simple remedies which may be applied by stock raisers in assisting the work of veterinarians in the treatment of wounds, bruised shoulders, colic, scratches, and laminitis.

The veterinary pharmacopœia and manual of comparative therapy, G., C., and A. GRESSWELL (*London: Baillière, Tindall & Cox, 1903, 2. ed., pp. XIII+457*).—In this edition numerous alterations and additions have been made for the purpose of incorporating material to represent the later discoveries in the field of veterinary medicine and therapeutics. A discussion of the various drugs is arranged in an alphabetical manner and involves an account of the composition, characteristics, therapeutics, and doses.

Disinfecting value of certain formaldehyde preparations, K. KOKUBO (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 7, Orig., pp. 568–571*).—A comparative test was made of carbolic acid, old and new Septoforma, and formalin soap in the destruction of anthrax spores, *Staphylococcus aureus*, Streptococcus, and typhoid bacilli. Anthrax spores were found to be alive after exposure for 95 days to a 1 per cent carbolic acid solution and were killed by exposure for 25 days to a 3 per cent solution. When exposed to a 10 per cent formalin soap the anthrax spores lived but a few hours.

Panaceas in veterinary medicine, E. THIERRY (*Jour. Agr. Prat., n. ser., 5 (1903), No. 9, pp. 290, 291*).—Notes are presented on a number of remedies which have been recommended as capable of producing great curative effects in a large variety of diseases. The author believes that none of these remedies are as effective as represented.

Animal parasites of man, M. BRAUN (*Die thierischen Parasiten des Menschen. Würzburg: A. Stuber, 1903, 3. ed., pp. 360, figs. 272*).—This volume constitutes a handbook on the animal parasites of man and is intended for the use of students and physicians. It includes a general discussion of parasites and their life histories, together with special accounts of the various parasites belonging to different orders and families of animals which have been observed in or upon man under parasitic conditions.

AGRICULTURAL ENGINEERING.

Review of irrigation investigations for 1902, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 359–385, pls. 6*).—The causes of the recent rise in value of irrigated lands and water rights and the need of enactment of better irrigation laws are discussed; the purpose and scope of the irrigation investigations

of this Office are explained; and the results obtained in studies relating to irrigation laws and institutions and to the duty of water are briefly summarized. The practical bearing and influence of the work are also pointed out.

Special attention is given to a discussion of losses by seepage and of drainage as a necessary accompaniment of irrigation; the importance of developing inquiries along other lines of agricultural engineering, including investigations relating to the pumping of water for farm uses and to farm buildings and machinery; the water-right problems of the arid region; and irrigation in the humid sections of the United States and in the insular possessions. A list of 7 publications issued during the year is appended.

The drainage work has proceeded far enough to show that drainage in connection with irrigation presents some very different problems from those encountered in such work in humid regions and that to be effective different methods must be followed; for example, the drains must be placed at a greater depth.

As regards irrigation in the humid portion of the United States, the report says: "There are few sections in the United States where at some time during the growing season a drought of greater or less severity is not experienced each year, and where the application of water, if for a brief period only, would not secure largely increased yields. It remains to be determined, however, whether this kind of irrigation will pay. The number of farmers who are establishing experimental irrigation plants is already large, and the advice given by this Department during the last season affected the expenditure of several hundred thousand dollars. . . . In addition to this general assistance, systematic studies of the possibilities of irrigation in the humid portions of the United States are now being carried on in Wisconsin, Missouri, and New Jersey in cooperation with the State agricultural experiment stations of those States. The results in 1901 were all in favor of irrigation because the season was dry. The results in 1902 were less favorable because the season was wet."

Irrigation, C. H. SHINN (*California Sta. Bul. 147, pp. 65–71, figs. 4*).—The amounts of water used on a large number of fruits and other plants at the Southern California substation are reported. The amount applied during the 18 months from September, 1897, to April, 1899, including 15.1 in. of rainfall, was on the average for all crops a little over 25 in. Irrigation of oranges by means of deep and shallow furrows was tested, with results decidedly favoring the use of deep furrows. (See also E. S. R., 13, p. 952.)

Irrigation, W. J. ALLEN (*Agr. Gaz. New South Wales, 14 (1903), No. 6, pp. 538–545, figs. 8*).—Practical information regarding the construction of water channels, the leveling of land, and the application of water to different crops is given. Some results of the use of irrigation in different parts of New South Wales are also reported.

The amount of water used in field irrigation, S. FORTIER (*Montana Sta. Rpt. 1902, pp. 113–116*).—This is a brief summary of observations made in cooperation with this Office and already published in detail in the bulletins of the Office.

Pumping for irrigation from wells, J. J. VERNON and F. E. LESTER (*New Mexico Sta. Bul. 45, pp. 67, figs. 36*).—This bulletin records the results of experiments in pumping water for irrigation at the station farm. "The conditions existing in the Mesilla Valley, where the experiment station is located, are probably fairly typical of those to be found throughout the greater part of the valley of the Rio Grande. . . .

"The various strata found throughout the valley consist of layers of soil, sand, and gravel, of varying degrees of coarseness, with occasional layers of hardpan or clay. Sand evidently forms the greater part of the strata in the valley and in many parts extends to the surface, although usually covered by a layer of sediment and rich soil varying in thickness from a few inches to many feet. It seems to be generally true that most of the valley is underlaid at a reasonable depth with gravel beds sufficiently thick to procure from them by means of slotted strainers an ample water supply. In the Mesilla Valley a gravel bed is usually found at from 20 to 80 ft. in depth, although

there is no certainty as to the depth at which it will be found or the thickness of the stratum. . . .

"Throughout the whole length of the valley proper water will be found at a depth of from 4 or 5 ft. to 20 or 30 ft., depending upon the height of the ground above the level of the river bed. This water appears to be generally of a good and fairly uniform quality throughout the valley, though near to the foothills the quality is an uncertain thing. In the matter of quantity it seems to be more a matter of providing means for making the water available than any question as to the underflow."

The open well is considered in most respects preferable to the pipe, but under present conditions is too expensive.

Methods of sinking wells, installing pumps and strainers, and operating pumps are explained. The results of comparative tests of 8 pumps of various types (centrifugal and rotary) and sizes and of 4 kinds of fuel (cottonwood, tornillo, and coal) are reported. Data regarding pumping plants in New Mexico and other States are given.

Summarizing the results of studies and observations, the authors state that—

"An ample quantity of water for irrigating purposes exists throughout the Rio Grande Valley in southern New Mexico at a comparative shallow depth.

"This water, termed the underflow, can be easily made available by sinking pipe wells, with slotted strainers, into the gravel strata at comparatively low cost.

"The station at Mesilla Park sank an experimental well 6 in. in diameter and 48 ft. deep from which was pumped a continuous stream of over 1,000 gals. a minute.

"From this well it was found possible, using a 20-horsepower steam engine with tornillo wood as fuel, to irrigate average land 3 in. deep at a maximum cost of from 51 cts. to 64 cts. an acre, according to the pump used. This estimate is for short runs; for long runs this cost will probably be reduced, a point to be determined later. . . .

"A study of the relative conditions existing in New Mexico and other States shows that in the Rio Grande Valley in southern New Mexico at least the conditions are unusually favorable for the successful and economical operation of pumping plants as a means of supplying water for irrigating purposes."

Contributions to the study of drainage and irrigation, E. Risler and G. Wery (*Ann. Inst. Nat. Agron., 2. ser., 2 (1903), No. 1, pp. 5–18*).—This article discusses the consumption of water by plants and the relation between the distribution of rainfall in different parts of France and the water requirements of plants.

Discharge of the principal rivers of Montana, J. S. Baker (*Montana Sta. Rpt. 1902, pp. 117–131*).—A tabular record of stream measurements made in cooperation with the U. S. Geological Survey.

The resistance of road vehicles to traction, A. Binnie et al. (*Rpt. British Assoc. Adv. Sci., 1902, pp. 314–349, pls. 4, figs. 4*).—This is the report of the committee appointed to consider this subject. It reviews the investigations of Corréze and Manès (1832), Coriolis (1835), Morin (1837–1842), Dupuit, Edmund Leahy (1847), Charié-Marsaines, A. Michelin (1896), W. C. Unwin (1897), H. S. Hele-Shaw (1897), and I. O. Baker (1902), and describes the apparatus and methods used and results obtained in some tests made by the committee.

The experiments undertaken were intended "to determine the relation between the tractive effort and the following, viz, load, diameter of wheel, width and section of tire, hardness of tire (in the case of pneumatics), effect of springs, and velocity for every type of road under all circumstances, and any other relations that may be suggested during the progress of the work."

The special dynamometer apparatus used in the tests is described in detail. It consists of a castor frame in which can be mounted the wheel to be experimented on, a system of levers for transmitting to a small plunger the pull exerted on the wheel, and a recording pressure-gauge for registering the same, together with a recording tachometer.

"In performing an experiment a given type of wheel is mounted in the frame and a run made over a piece of road of the desired type. Since the 2 graphs are side

by side, the relation between tractive force and velocity can be seen at every point of the run, and from those portions of the graph where the velocity is constant and of the required value a mean tractive effort can be obtained. After a number of experiments have been performed curves can be plotted and empirical formulæ deduced for the various relations.

"As the dynamometer has only been completed such a short time, the trials are as yet only preliminary. The general results, however, tend to confirm those of previous investigators."

A text-book on roads and pavements, F. P. SPALDING (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1903, pp. VIII + 235, figs. 44*).—This is the second revised and enlarged edition of this work.

Highway construction in Wisconsin, E. R. BUCKLEY (*Wisconsin Geol. and Nat. Hist. Survey Bul. 10, 1903, Economic ser. 6, pp. XVI + 339, pls. 106*).—It is stated that the information contained in this bulletin "is intended primarily for those interested in the construction and maintenance of streets in cities, towns, and villages in Wisconsin, although a great part of the report is equally applicable in the principles of street construction and maintenance to rural districts. An attempt has been made to discuss impartially the different pavements, hoping to furnish unbiased and reliable information as to their merits." Data are given as to methods and cost of construction and maintenance, sources, quality, and methods of testing materials used in highway construction, and durability of different kinds of highways. Satisfactory results were obtained from abrasion tests, in which the Duval abraiding machine was used. The results of the tests of the cementing power of the finely ground stone as determined by the Page method were very discordant and unsatisfactory.

Machine threshing and seed grains, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 28, pp. 42, 43*).—The injury to seed grain in threshing is briefly discussed.

The comparative value of different forms of power in agriculture, H. HOLLDACK (*Fühlings Landw. Ztg., 52 (1903), Nos. 12, pp. 416–420; 13, pp. 458–465, figs. 2*).—A general discussion.

Modern silage methods (*Salem, Ohio: The Silver Mfg. Co., 1903, pp. 199, figs. 30*).—A summary of information regarding the construction of silos and the preparation and use of silage.

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1902 (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 547, pls. 48, figs. 2*).—This contains a report on the work and expenditures of the agricultural experiment stations in the United States for the fiscal year ended June 30, 1902, including a review of the work of this Office; summarized accounts of the meetings of the Association of American Agricultural Colleges and Experiment Stations and the American Association of Farmers' Institute Workers held in 1902; a list of the publications issued by this Office and the experiment stations during the calendar year 1902; Federal legislation, regulations, and rulings affecting agricultural colleges and experiment stations; annual reports of the experiment stations in Alaska, Hawaii, and Porto Rico; a review of irrigation investigations for 1902; and several articles relating to nutrition investigations, agricultural education, and cooperative experiments. Parts of this report are abstracted elsewhere in this issue.

Annual Report of Idaho Station, 1902 (*Idaho Sta. Rpt. 1902, pp. 24*).—This includes the organization list of the station, reports of the director and heads of departments, a summary of meteorological observations noted elsewhere, and a financial statement for the fiscal year ended June 30, 1902.

Fifteenth Annual Report of Massachusetts Station, 1902 (*Massachusetts Sta. Rpt. 1902, pp. 163*).—This includes a list of the officers of the station, an outline of the more important work undertaken, a financial statement for the fiscal year ended June 30, 1902, and departmental reports, parts of which are noted elsewhere.

Ninth Annual Report of Montana Station, 1902 (*Montana Sta. Rpt. 1902, pp. 131*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1902, a report of the director discussing agricultural conditions in the State and reviewing the work of the station, and departmental reports for the year ended November 30, 1902, parts of which are noted elsewhere.

Annual Report of New Jersey Stations, 1902 (*New Jersey Stas. Rpt. 1902, pp. XVII+593*).—This includes the organization lists of the stations; a financial statement of the State station for the year ended October 31, 1902, and of the college station for the fiscal year ended June 30, 1902; a report of the director reviewing the different lines of station work; and reports of the chemists, assistant in soil chemistry and bacteriology, assistant in horticulture, assistant in dairy husbandry, biologist, botanist, and entomologist. Reprints of Bulletins 160 of the station on Feeding Stuffs (E. S. R., 14, p. 380) and 163 on Fertilizers (E. S. R., 14, p. 749) are included in the report of the chemists.

Thirteenth Annual Report of North Dakota Station, 1902 (*North Dakota Sta. Rpt. 1902, pp. 128*).—This includes the organization list of the station, a brief report of the director, reports of the heads of the different departments including the results of experimental work noted elsewhere, a summary of Bulletin 53 of the station on Food Adulteration (E. S. R., 14, p. 892), and a financial statement for the fiscal year ended June 30, 1902.

Annual Report of Pennsylvania Station, 1902 (*Pennsylvania Sta. Rpt. 1902, pp. 483*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1902; a report of the director reviewing station work during the year and discussing the needs and future of the station; and departmental reports containing in addition to accounts of the different lines of work several articles noted elsewhere in this issue. The following articles in essentially the same form or abridged have already been noted from other sources: Pennsylvania sugar beets in 1901 (E. S. R., 14, p. 141), errors in manure sampling and analysis (E. S. R., 14, p. 938), effects of fermentation upon the chemical composition of cider and vinegar (E. S. R., 14, p. 1027), changes in the composition of milk during its delivery (E. S. R., 14, p. 489), available energy of timothy hay (E. S. R., 14, p. 993), combustible gases excreted by cattle (E. S. R., 14, p. 994), rearing of calves on milk substitutes (E. S. R., 14, p. 479), and weeds in general—two newcomers into Pennsylvania (E. S. R., 14, p. 52).

Fifteenth Annual Report of Rhode Island Station, 1902 (*Rhode Island Sta. Rpt. 1902, pp. 203–412+VIII*).—This contains a brief biographical sketch of the late Joseph A. Tillinghast, a report of the director on the different lines of station work, reports of divisions and articles abstracted elsewhere, a financial statement for the fiscal year ended June 30, 1902, acknowledgments, and a complete list of the publications of the station since its organization.

Farmers' institutes in the United States, D. J. Crosby (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 461–480*).—A general survey is given of the institute movement in the United States and of the work and appropriations in each of the different States during the year.

Farmers' institute bulletin, 1902 (*Mississippi Sta. Bul. 80, pp. 59, figs. 15*).—This is a summary account of the round-up farmers' institute held at the college in August, 1902. Some of the subjects discussed were as follows: The Relation of the Experiment Station to Mississippi Farmers, and The Functions of Live Stock on the Farm, by W. L. Hutchinson; Raising Beef Cattle for Profit in Mississippi, by E. R. Lloyd; Farm Drainage, by J. W. Fox; The Relation of the United States Department of Agriculture to the Farmer, by C. B. Smith; Commercial Horticulture in Mississippi, by A. B. McKay; Dairying in Mississippi, by J. S. Moore; The Breeding and Development of Dairy Cows, by Ada F. Howie; Some Diseases of Farm Animals and How to Treat Them, by J. C. Roberts; What Chemistry Has Done for the Farmer, by W. R. Perkins; and Mississippi Agriculture as Viewed by an Outsider, by H. E. Stockbridge.

Some features of recent progress in agricultural education, A. C. TRUE (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 417–459, pls. 2*).—This article presents some of the main features of recent advancement in agricultural teaching and methods in this country. An account is given of the 4 weeks' graduate school of agriculture held at the Ohio State University in July, 1902. A paper was read by the author at that meeting showing that agriculture at the present time is as truly a science as is that of geology, geography, or medicine. The educational values of courses in agriculture are discussed at some length and concrete examples given of present courses in agriculture in colleges, secondary agricultural schools, and town high schools.

The improvement of education in rural schools, J. W. ROBERTSON (*Ontario Agr. and Expt. Union Rpt. 1902, pp. 78–84*).—A general discussion of this subject.

Cooperation between experiment stations and farmers (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 491–540, pls. 5, fig. 1*).—In this account an attempt is made to bring out the origin and history of the movement for cooperation between the experiment stations and farmers; the present status of the movement, including details as to the extent and character of different phases of the work; and the value of cooperative experiments to the station or college, the farmers, and to agricultural science.

As typical of this work examples in the Southern States, Middle West, and Northern States and Canada are cited. Southern work is illustrated concretely by the cooperative experiments conducted by the Alabama Station, which are reviewed in detail by J. F. Duggar. Cooperative work in the West is illustrated by experiments carried out under the direction of the Illinois Station and reported by E. Davenport. In the North the cooperative work done in New York State by the college of agriculture of Cornell University is selected for illustration, the work being described by J. L. Stone; and Canadian work is reported by C. A. Zavitz, of the Ontario Agricultural College.

Cooperative work between farmers and stations has been found to furnish ready means for distributing and testing improved varieties of seeds and plants throughout the country, and for bringing the agricultural colleges and experiment stations into close and mutually helpful relations with the farming communities. Besides it is a valuable training for the farmers themselves in systematic and accurate work.

"Popular" editions of station bulletins, F. H. HALL (*U. S. Dept. Agr., Office of Experiment Stations Rpt. 1902, pp. 481–489*).—The author shows that simple condensed summaries of station work are much in favor with farmers in New York, and that where stations publish more than 10 bulletins averaging 30 pages each in the year enough can be saved on printing to pay the expenses of an expert editor.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, Vol. 5, Nos. 1, pp. 1–8; 2, pp. 9–16; 3, pp. 17–24*).—These numbers, for May, June, and July, 1903, contain the usual statistical information on the condition of crops in the United States and foreign countries.

Agricultural statistics of Ireland, 1902 (*Dublin: Dept. Agr. and Tech. Instr., 1903, pp. XLIX+165, dgms. 3, map 1*).

Agriculture for beginners, C. W. BURKETT, F. L. STEVENS, and D. H. HILL (*Boston and London: Ginn & Co., 1903, pp. XII+267, pl. 1, figs. 215*).—The authors believe that the theory and practice of agriculture can and should be taught in the public schools, and they have prepared a suitable text-book for this purpose. They "see no difference between teaching the child the fundamental principles of farming and teaching the same child the fundamental truths of arithmetic, geography, or grammar." The book is written in a pleasing manner and is well illustrated. The subjects treated have been carefully and appropriately selected. Chapters are devoted to the soil; the soil and the plant; the plant; how to raise a fruit tree; the diseases of plants; orchard, garden and field insects; farm crops; domestic animals, and farm dairying. The book is a valuable addition to the facilities for teaching the elements of agriculture.

NOTES.

Alaska Stations.—H. P. Nielsen, of Kansas, who has been in charge of the Kenai Experiment Station since April 1, 1899, has resigned, his resignation to take effect November 1. He will be succeeded by P. H. Ross, a graduate of the Kansas Agricultural College, who has been Mr. Nielsen's assistant the past summer. W. L. Neal, who has been assistant to the superintendent of the Copper River Station the past summer, has also resigned, his resignation to take effect November 1.

Arizona University.—President F. Y. Adams severed his connection with the university during the summer, and has been succeeded by Kendrick C. Babcock, Ph.D., assistant professor of American history at the University of California.

California Station.—The poultry station authorized by the last legislature has been established in the vicinity of Petaluma, Sonoma County, and H. O. Woodworth, of the New York State Experiment Station, placed in charge. V. A. Moore, of the Veterinary College at Cornell University, spent some weeks in California during the past summer investigating the pathology of poultry diseases for the station. Warren T. Clarke, the field entomologist of the station, has been appointed assistant superintendent of university extension in agriculture or farmers' institutes. This will not, however, take him entirely from active work in investigations in entomology. W. H. Volck has been appointed temporary assistant field entomologist in the codling moth investigation. Santa Cruz County has made an additional appropriation of $150, thus making the total appropriation for this investigation from Santa Cruz and Monterey counties $2,750. Several rooms are being added to the third story of the agricultural building to provide for the fertilizer control work.

Connecticut College and Storrs Station.—B. B. Turner, Ph. D., recently instructor in chemistry at Cornell University, has entered upon his duties as chemist to the college and station, vice C. A. Meserve, who has resigned to accept another position. A small laboratory has been fitted up for the station in the chemical building. The college has revised its course of instruction somewhat and hereafter will not give a degree to the four-year students who have entered the college from the grammar schools, but a diploma instead, two years' additional work being required for the bachelor degree.

Delaware Station.—Clayton O. Smith has been appointed assistant in bacteriology.

Hawaii Station.—A tract of about 100 acres of land in Kona, on the island of Hawaii, is to be turned over to the use of the station for the purpose of making experiments in tobacco culture. One crop of tobacco has been grown under shade at Honolulu and has been sent to this country for fermenting. The crop made a satisfactory growth but its quality is not yet known.

Illinois College and Station.—The following new appointments have been made for the ensuing year: Joseph W. Hart, formerly of the South Carolina College and Station and recently superintendent of the Kingston Dairy School, has become chief assistant in dairy manufactures in the station and instructor in dairy manufactures in the college; Cassius C. Hayden and Herbert A. Hopper, assistants in dairy husbandry in both college and station; and Carl E. Lee, assistant in dairy husbandry in the station. Louis D. Hall has succeeded E. B. Forbes, who has gone to Missouri, as instructor in beef cattle; William Dietrich, a graduate of the University of Wisconsin, has been appointed assistant in swine husbandry in the station and instructor in

e college; Edwin S. Good, assistant in animal husbandry in the station; and ufus C. Obrecht, assistant in horse husbandry in both college and station. lbert N. Hume, a graduate of Purdue University, succeeds Dwight S. Dalby as structor in farm crops. Clifford Willis has been appointed assistant in soil physics both college and station, and James H. Pettit, formerly assistant in chemistry, has ecome assistant in soil analysis in the station and in soil fertility in the college. urt A. Schroeder and Ira O. Schaub have also been added to the chemical force of e station, and James T. Barrett has become assistant in botany in the station.

Iowa College and Station.—C. J. Zintheo, recently of the North Dakota College, as entered upon his duties as professor of farm mechanics in the college. This ork has recently been organized as a branch of the agronomy department of the ivision of agriculture, and is intended to cover instruction in all kinds of farm achinery and appliances, including land drainage, rural telephones, farm water upply, and the various means of obtaining power for operating farm machinery, ich as electric motors, gasoline engines, steam engines, water power, and wind ower. A four-story fire-proof building, 60 by 100 ft., is now being erected as a boratory for conducting this work. J. J. Repp has resigned as veterinarian and rofessor of pathology and therapeutics, and has been succeeded by Carl W. Gay. I. Jacob, of Knoxville, Tenn., a graduate of the Pennsylvania Veterinary College, as been elected to the chair of veterinary medicine and sanitary science. W. H. tevenson has been advanced to the head of the department of soils and A. T. Erwin as become associate professor of horticulture. G. I. Christie has been appointed ssistant in soils, and Wayne Dinsmore assistant in animal husbandry.

Kansas College and Station.—The college has commenced the erection of a commodi-us auditorium, for which an appropriation of $40,000 was made by the last legis-ature of the State. A building to be used exclusively by the dairy department is lso being erected at a cost of $15,000, which will contain class rooms as well as uarters for dairy manufacturing. Oscar Erf, instructor in dairy husbandry in the Jniversity of Illinois, now occupies the chair of dairying and animal husbandry, and R. J. Kinzer, formerly superintendent of the Iowa College farm, has been elected ssistant in the animal husbandry work in the college. F. D. Coburn, William Hunter, J. M. Satterthwaite, and S. J. Stewart, of the board of regents, have retired nd are succeeded by C. E. Friend, of Soldier; R. J. Brock of Manhattan; J. W. Berry of Jewell; and J. O. Tulloss of Sedan.

Maine University and Station.—W. N. Spring has been appointed professor of for-stry; Edith M. Patch, of the University of Minnesota, entomologist to the station, nd S. C. Dinsmore, a graduate of the university, assistant chemist to the station. V. D. Hurd, a graduate of the Michigan Agricultural College, and during the past ummer agricultural demonstrator for the Rhode Island College, has become pro-essor of agronomy, and will have charge of the college farm.

Massachusetts College and Station.—George A. Drew, assistant horticulturist, esigned early in September to accept a position as superintendent of a large estate n Greenwich, Conn. He is succeeded by George O. Greene, recently assistant orticulturist at the Kansas College and Station.

Minnesota College.—F. D. Tucker, who for several years past has occupied the osition of principal of the school of agriculture, has resigned to become president of Memorial University, Mason City, Iowa.

Missouri University and Station.—E. H. Favor has been appointed assistant in orticulture at the university and station. W. L. Howard has been promoted to he position of instructor in horticulture, and Robert J. Foster has been appointed nstructor in veterinary science.

Montana College and Station.—F. W. Traphagen has resigned to accept the chair of metallurgy and assaying in the State School of Mines, at Golden, Colo.

New Hampshire College and Station.—The inauguration of President W. D. Gibbs and the formal dedication of the new agricultural building occurred October 28. The dedicatory address was delivered by Dr. A. C. True, of this Office. E. L. Shaw, formerly assistant in agriculture at the Missouri Station, has been appointed assistant professor of animal husbandry in the college, and F. W. Taylor, of the Bureau of Soils, professor of agronomy. Percy A. Campbell has been appointed superintendent of the college farm. Herbert H. Lamson, bacteriologist, has resigned to become professor of natural science in the State Normal School at Plymouth.

New Mexico College and Station.—R. F. Hare, formerly assistant professor of chemistry, has been elected professor of chemistry in the college and chemist to the station. The 22-horsepower oil-burning engine recently installed for pumping water for irrigation has proved quite satisfactory. The preliminary runs showed a cost of 30 cts. for irrigating an acre 3 in. deep, using crude oil at 5⅜ cts. per gallon, as compared with 70 cts. per acre with wood and $1.30 with coal, the same pump being used in each case. Contrary to the prevalent belief that Irish potatoes could not be grown in this locality, several varieties in a test this season produced quite well.

New York State Station.—Victor H. Lowe, until recently entomologist to the station, died August 27, at Fort Collins, Colo., where he had gone in the hope of recovering his health. In his death the station loses a very successful and enthusiastic worker, thoroughly imbued with the spirit of scientific investigation, and alive to the importance of economic entomology in agricultural and horticultural practice. His work was marked by thoroughness and its practical nature, and he was one of the most popular of the New York State Institute speakers. Mr. Lowe was a graduate of the Michigan Agricultural College in the class of '91, and was appointed to a position in entomology in the New York State Station in 1893, rising to the head of the department in a few years. His chief investigations at the station were on the army worm, case bearers, nursery stock pests, plant lice, cottonwood-leaf beetle on willows, raspberry sawfly, tent caterpillars, the cankerworm, and San José scale, while considerable study was given to the matter of spraying with crude petroleum, with kerosene, and with lime, sulphur and salt mixture, and to the devising of a convenient box fumigator for small orchard trees. Mr. Lowe is succeeded at the station by P. J. Parrott, of the Ohio Station, formerly an assistant at the Geneva Station. Martin J. Prucha, formerly assistant to H. W. Conn, of Wesleyan University, has been appointed assistant bacteriologist, and E. B. Hart has been promoted to the position of associate chemist. The construction of a horse barn has just been commenced, and the contracts let for fire protection. The latter include a chemical engine, a 15,000-gal. tank on a 100-ft. tower, hydrants, and 1,000 ft. of hose with 3 carts.

North Carolina College.—The following appointments in the chemical department of the college are noted from *Science:* William G. Morrison, M. A. (Virginia), instructor in chemistry; Robert W. Page, B. S. (Columbia), instructor of analytic chemistry and metallurgy; Albert A. Haskell, B. S. (Massachusetts Institute of Technology), instructor in dyeing; O. M. Gardner, B. S. (North Carolina College), instructor in chemistry.

Ohio College and Station.—Friend Whittlesey, of the board of control, died September 13. F. A. Derthick, master of the State Grange, has been appointed to succeed him.

Oklahoma College and Station.—E. H. Riley, a graduate of the Minnesota School of Agriculture and of the University of Minnesota, has been appointed assistant in animal husbandry in the college and station, succeeding R. C. Obrecht.

Rhode Island Station.—J. W. Hutchins, of the Michigan Agricultural College, has been appointed agricultural demonstrator to succeed W. D. Hurd, who, as mentioned above, has gone to the Maine College and Station. This officer, provided for by State appropriation, has proved a most satisfactory experiment. The demonstra

or has gone out to the farmers in response to calls, and during the summer months there were more calls for his services than could be met. He was frequently called upon to visit 4 or 5 farmers in a single day to give advice and demonstrations in spraying, the treatment of soils, and other practical questions. He carried the work of the station directly to the farmers, and also brought the farmers into closer touch with the college by explaining the opportunities which it afforded for agricultural instruction. The work of this officer was the more important from the fact that the State has no organized farmers' institutes. The station has obtained results indicating that ignited alumina phosphate is of little or no value to most crops when used upon a very acid soil. This substance shows a high percentage of reverted phosphoric acid, and is said to be used quite extensively in certain ready mixed commercial fertilizers, upon which account these results are rendered particularly valuable.

South Carolina College and Station.—O. M. Watson, poultryman, has resigned, and the division has been temporarily discontinued. C. O. Upton, chief of the dairy and live stock division, has resigned. An appropriation of $40,000 has been made for the erection of a central agricultural building. Thirty-two local institutes were held during July and August, with an aggregate attendance of 8,690. Attendance on the State institute held at the college is estimated at 1,500. The interest in the institutes is rapidly increasing.

Texas College and Station.—John A. Craig, formerly of the Wisconsin and Iowa colleges and stations, but for several years not connected with station work, has been elected director of the station and lecturer on animal husbandry. G. S. Fraps, Ph. D., of the North Carolina College and Station, has been elected assistant chemist to the station. B. C. Pittuck has resigned to become adjunct professor of agriculture at Louisiana State University.

Virginia Station.—J. B. McBryde has been appointed assistant chemist, and W. A. P. Moncure, assistant mycologist.

Washington Station.—R. E. Snodgrass, assistant entomologist, has resigned.

West Virginia University and Station.—Dr. A. C. True, of this Office, delivered an address at the convocation at the opening of the university September 23 on the subject of The Place of Agriculture in the University. Preparation is being made for more extensive work in dairy instruction, the legislature having appropriated $5,000 for that purpose. Rooms are being fitted up in the basement of one of the university buildings, and plans are being considered with reference to the formation of a herd. Walton K. Brainard, a graduate of the Michigan Agricultural College, has been placed in charge of the dairy work, and short courses will be offered during the coming winter. S. W. Fletcher, horticulturist, has resigned to accept a position at Cornell University in charge of the extension work.

Wyoming University.—Charles W. Lewis, M. S., D. D., formerly president of Moore's Hill College in Indiana, has succeeded E. E. Smiley as president.

New Agricultural College in Japan.—A new agricultural college, the third in that country, was opened at Morioka, Japan, in April last. The director of the new college is Professor Tamari, a graduate of the Michigan Agricultural College. The interest in agricultur l education in Japan is said to be quite widespread.

Experiment Station for Rhodesia.—The government of Rhodesia has established an experiment station about two miles from Salisbury, the capital town. The work at present will be conducted by the staff of the agricultural department, under the direction of E. Ross Townsend, secretary. This year about 100 acres were planted to grains, corn, Kafir corn, sorghum, cotton, tobacco, hemp, flax, cowpeas, and other leguminous plants. Special attention will be given to the breeding of disease-resistant plants, and work will also be carried on in the study of animal diseases. The work at the station will be supplemented by cooperative experiments with the farmers of the country. The agricultural department is about to establish an agricultural journal as an official organ and for the dissemination of information.

Agricultural Education in Jamaica.—In an article on this subject *Agricultural News* describes the attention which has been given to agriculture in the training of teachers for the elementary schools as a preliminary to the introduction of agricultural instruction in schools of that grade. Since 1900, 4 courses of lectures for teachers have been held, each lasting about 4 weeks, and including considerable practical work at the Hope Gardens. Nearly 200 of the Jamaica teachers in charge of schools have now attended such courses of instruction. Agriculture also occupies a prominent place in the curriculum of the training colleges, regular instruction being given in that subject during the 2 or 3 years that the students are in residence, together with considerable practical work. For a year past opportunities have been given at the government laboratory for young men intending to become planters or farmers to obtain an education in agricultural science as related to tropical agriculture. The course lasts for 2 years, and at its close a diploma may be granted by the board of agriculture. In addition to the above agencies there are 2 traveling instructors who give their whole time to lectures and demonstrations among the small settlers, as well as 3 local instructors under the agricultural society.

School Garden Exhibit.—What was probably the largest exhibit of this kind ever held in this country was made at the School of Horticulture at Hartford September 18. There were 150 individual exhibits, made by the boys and girls who have been working in the gardens and teachers who have been taking the course in gardening this year. The exhibits consisted of a long list of vegetables and several kinds of flowers. Prizes were awarded for the best-kept gardens, the best kept notebooks, and the best exhibit of products grown. An attractive feature of the afternoon was the hoeing contest, participated in by the second and third year pupils. Although the ground was very heavy with recent rains, this contest showed very good results. Flax and hemp, especially the former, were shown in all stages of their development, from the seed to the finished cloth, two flax-spinning wheels and a loom being in operation. The experimental plats of the school showed a great variety of field crops and vegetables, medicinal herbs, nursery stock, flowers, etc., and a series of fertilizer experiments on vegetables. In the evening there was an outdoor exhibition of magic-lantern slides, showing school gardens throughout the United States and in several foreign countries.

This year the school has had 120 boys and girls from the public schools, 27 from the Watkinson Farm School, and a class of 22 teachers from the Hartford public schools. The teachers commenced February 14, working every Saturday morning, beginning with greenhouse work and concluding with a garden 10 by 30 ft. for each teacher. Much interest has been displayed in the work.

Meeting of the American Pomological Society.—The twenty-eighth biennial meeting of the American Pomological Society was held in Boston, September 10–12. About 200 members were present, and the meeting was an enthusiastic and successful one. The sessions were held in the new Horticultural Hall of the Massachusetts Horticultural Society, where there was put on exhibition an extensive display of fruits representing all sections of the United States and Canada.

In his opening address President C. L. Watrous urged the desirability of experiments in cross pollination and the growing of seedling fruits in order that new varieties adapted to particular localities might be obtained. He favored a Federal law securing to originators of fruits exclusive right to their productions for a series of years, and also a law to control the shipping of nursery stock between States and foreign countries as a means for the better control of fungus and insect pests.

Prof. L. H. Bailey delivered an address on The Attitude of the Schools to Country Life. He pointed out that our present school system originated with the universities, and the ladder of learning was thus let down from above. The agricultural colleges are not filling quite the place it was expected they would. They have developed agricultural literature, established agricultural science, and raised the tone of farm

fe, but they do not reach the mass of people who live in the country. He urged he teaching in school of the things that men are interested in. The kindergarten as declared the most important thing that has come into our educational system. he vital factor in the teacher should be love and sympathy for the child, not the iving of information. The natural way to give agricultural education was believed be through the schools rather than by bulletins. The gist of the bulletins should e embodied in the text-book. Some statistics were quoted to show that as pupils the country schools grow older a smaller proportion affirm a desire to make a living by some phase of agriculture. One of the reasons for this would seem to be that he majority of the teachers in the country schools come from the city, and, consciously or unconsciously, attract the child's mind cityward. The announcement as made that it is proposed to establish a model country school building and rounds at Ithaca, under the auspices of Cornell University, at a cost of $1,000 to 1,500, to be supplied with pupils from the town, and to serve as a means for the etter training of teachers in agriculture.

In a paper on the Relation of Cold Storage to Commercial Orcharding, G. Harold Powell, of this Department, stated that cold storage is likely to have its greatest nfluence on the development of commercial apple growing. Quick-ripening fruits ike the peach, summer pears, and small fruits are not generally adapted to cold-torage treatment. They ripen in hot weather, and the end of their life is quickly eached unless ripening is checked by immediate storage. Even then they can be eld back only for a limited time. They rapidly lose their delicate aroma and lavor, and when placed on the market often deteriorate before reaching the con-umer. If summer fruits are stored, success demands that they be well ripened and hysically perfect when put in cold storage. They must be placed in small pack-ges, stored immediately after packing, and must be kept as cool as possible after emoving from storage and sold at once. Under these conditions berries may be tored a week, peaches 2 weeks, and Bartlett pears a month or longer if there is a lemand for the fruit. Refrigeration is likely to prove of special importance in the levelopment of apple growing in the States farther south. The speaker held that when stored as soon as picked many of the best varieties of the South equaled the arieties of the North in keeping quality. The local warehouse is considered the deal for quick storage and for the grower who is competent to handle his own crop. Cold storage is raising the standard of fruit growing by emphasizing the importance f physically perfect, well-developed fruit. It is directing attention especially to the act that diseased, wormy, poorly colored, immature, or bruised fruit has poor keep-ng quality. It emphasizes the necessity of careful picking, packing, and grading. Where the cold-storage warehouse is properly managed the better apples, like Grimes nd Mother, retain their finest qualities until March, and Jonathan, Northern Spy, nd Esopus Spitzenberg until April or May. There is always an undersupply of hese better varieties.

J. H. Hale, of Connecticut, discussed the subject of Grading and Packing Fruits or Long Shipment. Fruits for long-distance shipment must be grown for that pur-ose. Sorts that carry best are those grown on high, well-drained land on open-eaded trees. Color and quality in the fruit are secured by the liberal use of potash n the soil. The fruit when picked should be well matured, but not soft. It should e picked and shipped in rigid packages to prevent bruising. As soon as the fruit is aken from the tree it should be carried to the packing house and graded by hand nto different sizes, colors, etc. The best package for peaches and plums is the Georgia six-basket carrier, for apples and pears the 50-pound bushel box. All choice ruit should be wrapped in paper. It adds to the carrying and keeping qualities of he fruit, improves the color, and increases the returns from 10 to 25 per cent above he regular market price. When packed, the fruit should be placed in cold storage mmediately. Stripping off part of the leaves of very vigorous trees helps the color, exture, and shipping capacity of the fruit, but is slightly injurious to the quality.

In a paper entitled Should the Commercial Grower Plant Varieties of High Quality? G. T. Powell called attention to the great desirability and profit in growing fruit of high quality. Fruit of poor quality lessens the desire of the public for fruit, thus greatly affecting the demand.

The provisions and working of the Canadian fruit-inspection law passed in 1901 were explained by W. A. McKinnon, Chief of the Fruit Division of the Canadian Department of Agriculture. The law requires that the name and address of the grower be placed on every closed package of fruit, as well as a mark showing the grade. It is required that first-grade fruit shall consist of well-grown, nearly uniform specimens, well colored and uniformly packed. Ninety per cent of any package must be sound and free from worms or disease. If the fruit is packed so that more than 15 per cent is inferior to the facing, it is declared a misdemeanor. Under the terms of the law inspectors are empowered to enter all premises and inspect all packed fruit. They have the right to detain shipments until inspected, and to mark on the package the character of the fruit, but can not confiscate it. They are subject to fine if they exceed their authority by unnecessarily delaying shipment. The results of the policy of fruit inspection in Canada have been very gratifying. Confidence has been restored in British markets and the export trade developed wonderfully as a result of the act.

Dr. W. D. Bigelow, of the Bureau of Chemistry of this Department, discussed Pure Food Legislation and its Relation to the Fruit Grower, calling attention to the various methods used in adulterating jellies and other fruit products, and urging the desirability of a Federal law compelling the correct labeling of all fruit products. A resolution favoring such a law was adopted by unanimous vote.

Other papers read were as follows: Fruit Gardens, J. H. McFarland; Pomology at the St. Louis World's Fair, F. W. Taylor; The San José Scale in the Orient, C. L. Marlatt (E. S. R., 14, p. 535); Judging Fruits by Scales of Points, F. A. Waugh; Waste in Apples, W. R. Lazenby (E. S. R., 15, p. 43); Fruit Culture in the Pacific Northwest, S. W. Fletcher. One evening was given up to the discussion of ideals in pomology and another to the progress of pomology in America during the past fifty years.

The Ad Interim Committee on Examination of New Fruits, which has been established since the last biennial meeting, made its first report. The committee is composed of 50 members, headed by a general chairman and divided into 7 subcommittees of a chairman and 6 members each. Each subcommittee has jurisdiction over a certain class of fruits. It is their duty to examine and pass upon the merits of such seedling fruits as shall be entered and furnished by originators for examination when the fruit is in proper condition. The committee reported that 33 entries had been received during the year. A variety of peach from Georgia was named the Hiley, after the originator, and was awarded a Wilder medal.

A committee was appointed to prepare fruit score cards that may be used for judging fruits in the society's work and also at the coming World's Fair at St. Louis.

Additional by-laws were adopted by the society providing for a standing committee which shall report biennially on injurious insects and diseases of pomological importance.

One of the most important reports at the meeting was that of the special committee on revision of the rules of nomenclature, appointed at the Philadelphia meeting four years ago, which was adopted. The chief provisions of this report were as follows:

Rule 1. No two varieties of the same kind of fruit shall bear the same name. The name first published for the variety shall be the accepted and recognized name, except in cases where it has been applied in violation of this code. In explanation of this rule the paramount right of the originator, discoverer, or introducer of a new variety to name it within the limitation of this code is recognized and emphasized.

Rule 2. The name of a variety of fruit shall consist of a single word. One of the xplanations attached to this rule is to the effect that no variety should be named nless distinctly superior to existing varieties in some important characteristic, nor ntil it has been determined to perpetuate it by bud propagation, nor should the name f a person be applied to a variety during his life without his consent.

Rule 3. In the full and formal citation of a variety name, the name of the author vho first published it should also be given.

Rule 4. Publication consists (*a*) in the distribution of a printed description of the ariety named, giving the distinguishing characteristics of fruit, tree, etc.; or (*b*) in he publication of a new name for a variety that is properly described elsewhere, such ublication to be made in any book, bulletin, report, trade catalogue, or periodical, roviding the issue bears the date of its publication and is generally distributed mong nurserymen, fruit growers, horticulturists, etc.; or (*c*) in certain cases the general recognition of a name for a propagated variety in a community for a number of years shall constitute the publication of that name.

Rule 5. No properly published variety name shall be changed for any reason except conflict with this code, nor shall another variety be substituted for that originally described thereunder.

A large number of explanatory notes and interpretations accompany the code. Officers for the next two years were elected as follows: J. H. Hale, president; J. Craig, secretary; and L. R. Taft, treasurer. Seven silver Wilder medals and 8 bronze medals were awarded for exhibitions of fruit. One of the displays receiving a silver medal was that of a collection of 109 varieties of seedling apples from Minnesota.

Society of Horticultural Science.—Pursuant to a call issued by S. A. Beach, noted in a recent number of the Record, an organization of this new society was effected at Boston in September, in connection with the meeting of the American Pomological Society. About 30 prominent horticulturists, representing different sections of the United States and Canada, joined the society and others have signified their intention of doing so. The object and plans of the society are mentioned elsewhere in this number. The constitution provides for assigning subjects to referees and alternates for investigation. The subjects assigned for the next meeting were as follows: The Influence of Shade on Plant Culture, L. C. Corbett and B. M. Duggar; Orchard Tillage, A. R. Whitson and W. Paddock; Orchard Cover Crops, R. A. Emerson and J. Craig. A symposium on the progress of European and Canadian horticulture was assigned to 5 referees and as many alternates. The next meeting will probably be held at St. Louis during Convocation Week. The officers elected were as follows: President, L. H. Bailey; vice-presidents, T. V. Munson, G. B. Brackett, and E. J. Wickson; secretary-treasurer, S. A. Beach.

Necrology.—Veterinary science, comparative medicine, and hygiene suffered a severe loss in the death of Edmond Nocard, August 2, 1903, at the age of fifty-three years. Dr. Nocard was born in Provins, France, and after a classical college course entered the veterinary school at Alfort, where he graduated. His course in this institution was interrupted by service in the Franco-Prussian war. He subsequently became professor of pathology and clinical surgery at the Alfort school, and succeeded Goubaux as director of the school upon the retirement of the latter in 1887.

Dr. Nocard's contributions to veterinary science have been of unusual extent and value. He contributed greatly to the knowledge of rabies, tuberculosis, tuberculin, glanders, contagious pleuro-pneumonia, piroplasmoses, actinobacillosis, dourine, and other protozoan diseases, as well as to foot-and-mouth disease, contagious abortion, and white scour in calves. He was frequently called upon for important public service in the investigation and repression of animal diseases, not only in France but in various foreign countries, including the United States. His published works are exceedingly voluminous, including numerous articles in veterinary periodicals and more formal contributions, particularly the large volume entitled Maladies Micro-

biennes des Animaux, which was published in conjunction with Professor Leclainche and is perhaps the best work of its kind in existence.

Frederick Law Olmsted, celebrated American landscape architect, died at a sanitarium near his home in Brookline, Mass., August 28, aged 81 years. Mr. Olmsted established a new school of landscape architecture in America and did more to stimulate interest in it as an art and to influence its development than any other American. His name is associated with the development of more large park systems in this country than that of any other landscape architect. In cooperation with his partners he designed the public parks of New York City, Brooklyn, Boston, Montreal, Buffalo, and South Chicago; the Golden Gate Park at San Francisco, Niagara Falls Reservation, the World's Fair Grounds at Chicago, the U. S. Capitol Grounds and back terrace, the Biltmore Estate of G. W. Vanderbilt, and many other public and private parks. He was also the author of several books through which he first became known to the public. Among the more prominent of these are Walks and Talks of an American Farmer, A Journey through Texas, Our Seaboard Slave States, and A Journey to the Back Country. Mr. Olmsted retired from the active practice of his profession about 8 years ago, since which time the business has been carried on by John L. and F. L. Olmsted, Jr.

We note from *Science* that Ernest Menault, inspector-general of agriculture in France, and the author of numerous works on agriculture and economic entomology, has died at the age of 72 years.

Personal Mention.—Clarence T. Johnston, for several years past assistant in the Irrigation Investigations of this Office and in charge of the office at Cheyenne, Wyo., has resigned to accept the appointment of State Irrigation Engineer of Wyoming.

Clarence B. Lane, assistant in dairy husbandry at the New Jersey Station, has been appointed assistant chief of the Dairy Division of this Department. He succeeds Harry Hayward, who, as previously noted, resigned during the summer to assume charge of the newly organized agricultural department at the Mount Hermon School, near Northfield, Mass.

Charles V. Piper, of the Washington College and Station, has accepted an appointment as botanist in the Division of Agrostology in this Department, and will also have charge of the herbarium of grasses.

Alfred M. Sanchez, an assistant in the Bureau of Soils, has been appointed in the Bureau of Agriculture of the Philippines, where he will continue the soil investigations carried on last year by C. W. Dorsey.

Dr. David Morris, Imperial Commissioner of Agriculture for the West Indies, has been appointed by King Edward to be Knight Commander of the Most Distinguished Order of St. Michael and St. George.

Miscellaneous.—The Association of Official Agricultural Chemists will meet in Washington, November 20–23, immediately following the meeting of the Association of American Agricultural Colleges and Experiment Stations. The meetings of the chemists will be held in the lecture hall of Columbian University. The programme calls for reports of referees on food adulteration, dairy products, foods and feeding stuffs, sugar, nitrogen, potash, phosphoric acid, soils, ash, tannin, and insecticides, and of special committees on food standards and fertilizer legislation.

The Walnut Growers' Association of Southern California has offered an award of \$20,000 for a practical means of controlling the disease known as walnut blight or bacteriosis.

The report of the Irrigation Commission of India recommends the expenditure of \$150,000,000 in 20 years on protective works, and \$2,000,000 annually on loans for private irrigation work. The necessary funds are to be raised by loans and the interest charged to the famine grant.

The estate and garden of the late G. F. Wilson, near Woking, England, has been purchased by Sir Thomas Hanbury and presented to the Royal Horticultural Society.

EXPERIMENT STATION RECORD.

Vol. XV. November, 1903. No. 3.

The need of increased funds for the further development and extension of the experiment stations is brought out in the current report of the Director of this Office. The successful extension of their work in the case of a few stations, with the aid of special appropriations from the States, is cited as illustrating the possibilities for enlarging the scope of the stations' work and the widespread benefits to agriculture which may result.

The States have done much toward supplying the stations with suitable buildings and other facilities. This is in accordance with the intent of the Hatch Act. A number of States have gone further and have made appropriations for current expenses or for carrying on special lines of investigation. Notable instances of this during the past year are appropriations by the California legislature of \$5,000 for the establishment of a poultry station and \$3,000 for viticultural investigations; by the Illinois legislature of \$25,000 for live-stock investigations, \$25,000 for soil investigations, \$10,000 for corn investigations, \$10,000 for horticulture, and \$15,000 for dairying—a total of \$85,000 per annum; by the Wisconsin legislature of \$1,500 annually for two years for tobacco investigations and \$2,500 annually for cranberry investigations, \$10,000 for the purchase of live stock, and a like sum for additional farm lands; in Hawaii, \$16,800 in aid of the Federal station for two years; in Missouri, a special appropriation of \$10,000 for the station and large college appropriations in which the station will share; in Tennessee, \$10,000 for the purchase of additional farm lands and \$600 for cooperative experiments with field crops and fertilizers on the type soils of the State; and in Utah, \$11,650 for station equipment and maintenance.

A number of States have also made special appropriations for substations, several of which are new. For example, Kansas appropriated \$32,550 for the equipment and maintenance of the new Fort Hays Substation; Nebraska, \$15,000 for the establishment and maintenance for two years of a substation for the semiarid region in the western part of the State; North Dakota, \$5,000 for a substation to be located at Edgeley; and Utah, \$12,500 for the establishment and maintenance

for two years of five experiment farms in different sections of the State, to test the possibilities of nonirrigable lands.

This, in addition to the regular appropriations which several of the States are making, the provision for printing their bulletins and reports in a number of instances, and other assistance, makes a very creditable showing for a considerable number of the States and indicates the appreciation in which the stations are held. Less than half the stations, however, were affected by such legislation, or receive any financial aid from the States for maintenance.

During the past year fifty stations shared in the benefits of the Hatch fund. Twenty-three of these were given additional State aid and twenty-seven received none. Of the State appropriations for Federal stations, six did not exceed $1,000, and only eight equaled or exceeded the Hatch appropriation of $15,000. Several of the appropriations were for the support of substations and were not shared by the Federal stations. The total State appropriations for stations and substations were but little more than 51 per cent of the Hatch fund.

The meagerness of the funds available for investigation in the twenty-seven unaided Federal stations is shown by the following figures from the statistical reports on the expenditures of the Hatch fund in those stations: The total receipts from the Hatch fund were $405,000. The expenditures for administration and permanent improvements (salaries, labor, traveling expenses, postage, stationery, libraries, and fixtures) amounted to $313,086.38, or an average of $11,595 for each station. The average amount expended for publications was $760. This leaves an average for each station of only $2,645 for the general expenses of investigations (chemical supplies, fertilizers, feeding stuffs, tools, implements, and machinery, scientific apparatus, live stock, seeds, plants, sundry supplies, freight and express, heat, light, water, and contingent expenses). Dividing this sum by the average number of investigators, we have an average of $264.50 for each investigator. The whole amount ($2,645) would hardly pay the expenses of a good-sized feeding experiment or a field experiment involving tests in several different localities. How inadequate, then, does such a sum appear when divided among ten investigators. Under these conditions it is not strange that so many problems of the farm remain unsolved; it is wonderful that our smaller stations have accomplished so much.

These figures show conclusively that, if our stations are to be continued on the broad basis on which they are at present organized, they must be supplied with larger funds for the general expenses of investigation, in order to conduct their work in a thorough and satisfactory manner. The States can and undoubtedly will supplement the National funds more fully as time goes on; but since the results obtained by the stations are in many cases of general value to the agriculture of

the United States, it seems proper that they should receive additional financial aid from the National Government now that they have demonstrated their ability to stimulate and increase the agricultural production of the country. This supplemental aid should, of course, be granted under conditions which will insure its exclusive application to meet the expenses of agricultural investigations, and which will stimulate the States to increase their contributions to the support of the stations.

In this connection it is well to consider that, with the increase of agricultural operations in this country, the States generally will be called upon to establish a much larger number of stations or substations than at present exist. The areas over which many of the stations in this country are required to extend their jurisdiction are so large that they can not meet the demands for investigations adapted to the various conditions of soil, climate, and rational agricultural practice in their several States. In no section of the United States are there as many stations in proportion to land area as in France or Germany. In our smallest States along the Atlantic Coast we have one station for 24,000 square miles; France and Germany have eight times as many. The South Central States with their 10 stations are 40 per cent larger than all of France and Germany with their 151 stations, and Texas alone, with one Federal station, is 27 per cent larger than either of those countries. The ratio of stations to area in France and Germany is 96 to 1 as compared with Texas, 28 to 1 as compared with Minnesota and the Dakotas, and 39 to 1 as compared with the Pacific States.

Under present conditions the stations as a rule are not able to grapple with the larger problems of our agriculture in a sufficiently broad and thorough manner to give the surest expectation of success. Generally speaking, they are now in a position to utilize larger funds effectively, since questions relating to organization and methods and lines of work have been largely solved.

The kind of work most needed at present is expensive, requiring investigators of the highest ability, ample facilities in the way of equipment and assistance, and opportunity for concentration of effort without interruption from inspection or routine work or for instruction. The experiment station is a university department standing at the head of the institution, and the fundamental importance of its educational function is already apparent. Its chief business is to find out new applications of science to agriculture which shall result in improved practices and products. On its success depends not only the advancement of agricultural practice in particular regions, but also the effectiveness of the agricultural colleges and other institutions for agricultural education.

The amount of data published by the stations on many agricultural

subjects is now very large, and the attempts which have been made to reduce this material to organized form, in order that it may be utilized for purposes of agricultural education, have shown that the stations are doing a great work in supplying the materials out of which a definite science of agriculture is being constructed, and on which courses of instruction in agriculture of different grades can be successfully based. Hence the highest interests of agricultural education, as well as the practical interests of agriculture, call for increased thoroughness and efficiency on the part of the stations in their efforts to solve problems in agricultural science and practice.

It is encouraging to note the progress of experiment station work in Alaska, as evidenced by the reports of Prof. C. C. Georgeson from year to year. The work there differs from that in any other locality of this country owing to the conditions under which it is carried on and the fact that it usually precedes even primitive attempts at farming. There is as yet no basis of practical experience on which to fall back, but the work is laying the foundation for a future agriculture. It partakes of all the elements of pioneering in a new country, and from the inaccessibility of many parts of the country and uncertainties of transportation it is carried on under unusual difficulties.

This is illustrated by the experience in opening the new station at Copper Center the past season. This station embraces a tract of about 775 acres of land in the valley of the Copper River, which has been temporarily withdrawn from entry by the Secretary of the Interior and set aside for the use of the station. The nearest port is Valdez on Prince William Sound. A military trail has been constructed from Valdez to Eagle on the Yukon, a distance of about 500 miles, and Copper Center is located on this trail a little over 100 miles inland. A start was made from Valdez early in the spring to transport the equipment of the station which was absolutely necessary to begin the work. The team purchased for the station was used for this purpose but proved inadequate for the undertaking, as the trail was very difficult, and transportation was completed by contract at a price which would be prohibitive to the ordinary individual.

During the past season about 10 acres of land have been cleared, plowed, and seeded to spring crops. These consisted chiefly of varieties of oats, barley, spring wheat, emmer, buckwheat, and various grasses. The season was rather backward, and some of the cereals were not received in time for early sowing. Their growth was impeded by dry weather following the seeding, but in spite of this all were in quite a flourishing condition July 20, and it was believed that many of the cereals would mature by the end of August if frost did not intervene. As noted in previous reports, the newness of the ground had an important influence on the growth of the crops. Where brush had

een burned or the ground previously cleared the growth was much etter than elsewhere. The superintendent in charge of the station ucceeded in maintaining a fairly good garden, and peas, radishes, and ettuce were supplied from it by the middle of July. Other hardy egetables promised well.

A log house 14 by 28 feet was constructed during the past summer, nd additional buildings and equipment are urgently needed. In ddition to the ground seeded, 6 or 7 acres have been cleared and by ext spring it is expected to have at least 20 acres under cultivation, rains and forage plants being grown on a farm scale.

Professor Georgeson estimates that there are about 10,000 square niles of good agricultural land in this valley, with perhaps half as much nore in mountain valleys which lead out into the interior plain. The oil is rich and well adapted to cultivation, and it is believed feasible to grow good cereal crops at least three years out of four. Notwithstanding the rich mineral deposits of the Copper River country, it is believed that they will ultimately be exceeded by the value of the agricultural products, if this country is properly opened up.

We give in this issue the plans of the new building for farm mechanics at the Iowa Agricultural College. This department is not only new at that institution, but is one of the latest products of specialization in agricultural instruction in this country. It is an attempt to do for that part of rural engineering what has already been done for agronomy and for animal production at many of the colleges—to bring together in a logical way the scattered instruction which bears on this branch of agriculture, and to work out systematic and well-rounded courses in it.

A number of colleges are now considering the establishment of departments of rural engineering or farm mechanics, and there is much interest in the development of these subjects as independent lines of work. The Illinois College of Agriculture has had an instructor in farm mechanics for several years past; the Wisconsin College has received a State appropriation of $15,000 for a farm-engineering building, and the North Dakota College has of late been giving special attention to this subject. In Minnesota the College of Agriculture has obtained an appropriation of $5,000 for a building for its course on farm machinery, and the officers of the State fair have granted the college the use of a large pavilion in which machines loaned by manufacturers are to be housed for instructional purposes.

The opportunity for useful and effective work, both in instruction and in experimentation, is abundant; and the new courses will offer further opportunity for the agricultural student to specialize, and for the prospective farmer to receive systematic training in the theory

of farm-machinery construction, for example, as well as in its practical operation and management.

In no other country is such extensive use made of farm machinery and the scarcity of farm labor will tend to its increased use in th future rather than otherwise. The total value of implements an machinery on the farms of this country, according to the recent census was $761,261,550, an average of $133 per farm, taking the countr over, and of 90 cents per acre of farm land. Much of this machiner is elaborate and complicated in construction, and requires mechanica skill or genius for its most efficient operation and care, not to mentio the making of small repairs. It represents an important part of th farmer's invested capital upon which he must pay or earn interest That there is an enormous waste of money due to neglect and unskillful handling of this part of the farm equipment must be obvious t anyone who has traveled through the regions where it is most used.

The record of two tenants on neighboring farms in Nebraska is case in point as showing how much of this waste may be avoided These two men have been living on the same farms for the past nin years. One of them is still using the same harvester which he purchased the first year he took the farm; the other has bought and "wor out" three self-binders. In eight and a half years there has been difference of $1,900 in the outlay for farm machinery by these tw men. Both farms are about equally equipped. The difference is that as a result of better care and more skillful use, one man's tools hav lasted about three times as long as the other's. Such examples o extravagant mismanagement are by no means uncommon. It is ofte one of the great leaks on the farm.

The agricultural high school at Berlin has a well-developed an efficient department of farm machinery. In the opinion of the hea of that department, nothing has done more to improve agricultura methods in Germany than the study by the young men of the tools o their own and other countries; and out of it have resulted man improvements in construction. Other foreign institutions are givin attention to instruction and experimentation along these lines.

While farm machinery is only one of several subjects embraced i this new department, it will naturally be quite an important part a the outset. Along with it will go questions relating to farm buildings, silo construction, fence building, underdrainage, etc. Out o these can be constructed a department of instruction which wi strengthen and round out the work of the agricultural colleges, an will also suggest numerous lines of profitable investigation.

NEW BUILDING FOR FARM MECHANICS AT IOWA COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

The building for the new department of farm mechanics is an addition to Agricultural Hall, and is connected with it by a corridor 27 feet long by 15 feet wide. The main part of the new building is 60 by 100 feet and contains two main floors. Each of these floors has a balcony about 12 feet wide, which is supported by steel columns. The second floor balcony extends over only a part of that floor, the remainder being inclosed and constituting an attic or third floor. The effect is, therefore, that of a four-story building, there being windows on each of the main and balcony floors.

The first or ground floor (fig. 5) contains a large machinery operating room 66½ feet long by the full width of the building, with an approach 14 feet wide and paved with brick. This room will be used for the study and operation of farm motors, such as gas engines, steam traction engines, etc. At one side is a row of double forges supplied with blast from a fan, and a double row of anvils, for students' use, and across the end is a row of benches. On this floor are also located wood-working and iron-working shops for experimental purposes, both well equipped with hand and power machines, and also tool rooms, toilet room, and a supply of lockers. These rooms and the corridor all have a brick floor. The balcony of this floor will be used as a carpenter shop for students of this department, and be provided with circular saws, lathes, grindstone, emery wheel, etc.

On the second floor (fig. 6) are located offices for the head of the department, a class room about 21 by 30 feet, a drafting room 22 by 27 feet, and a students' study and reading room 17 by 22 feet. About half of this floor will be occupied by a smaller machine room 51 feet 7 inches by the width of the building. This room will be used for setting up, operating, and testing various kinds of farm machinery, such as binders, mowers, corn planters, corn shredders, plows, wagons, etc. The connection with the main building is upon this floor.

The balcony and third floor (fig. 7) will be used for storing farm machinery not in use, and will contain an office for assistants in the department, a mailing room, and several storage rooms. Photographic and dark rooms for instructing the students of this department in photography will be located on this floor.

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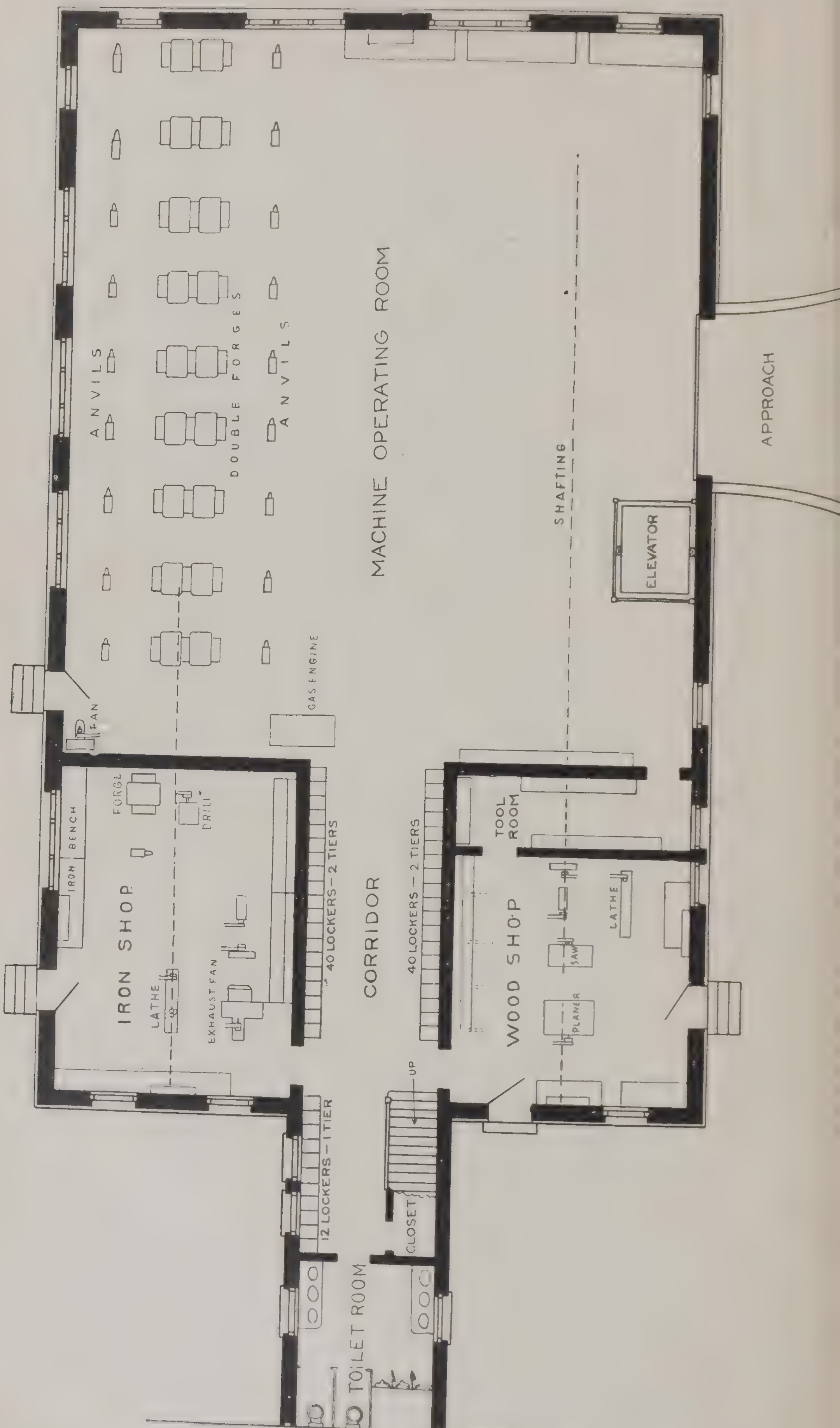
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DRILL
IRON BENCH
IRON SHOP
LATHE
EXHAUST FAN
40 LOCKERS—2 TIERS
CORRIDOR
40 LOCKERS — 2 TIERS
TOOL ROOM
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SAW
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12 LOCKERS—1 TIER
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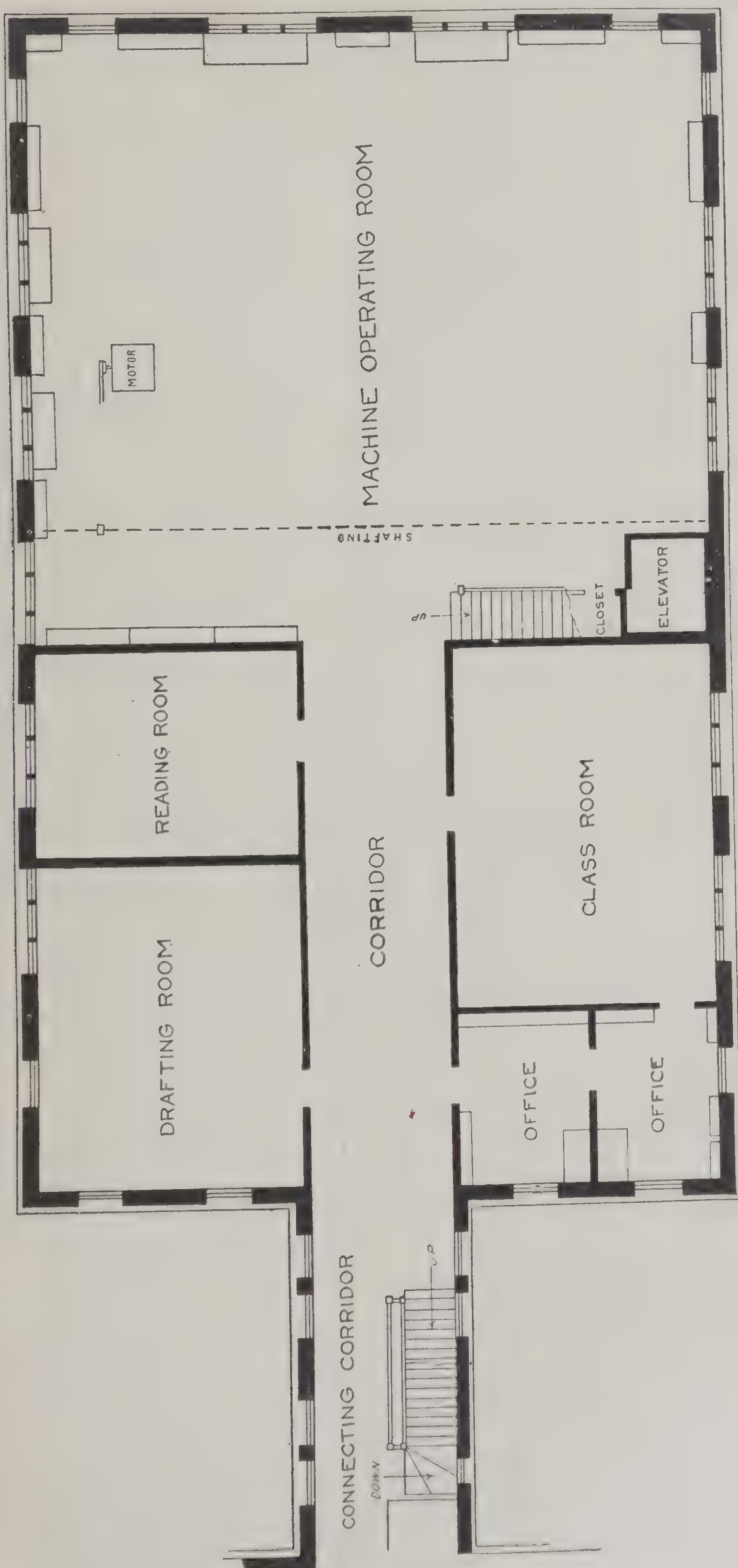

Fig. 6.—Second-floor plan of the Farm Mechanics' Building.

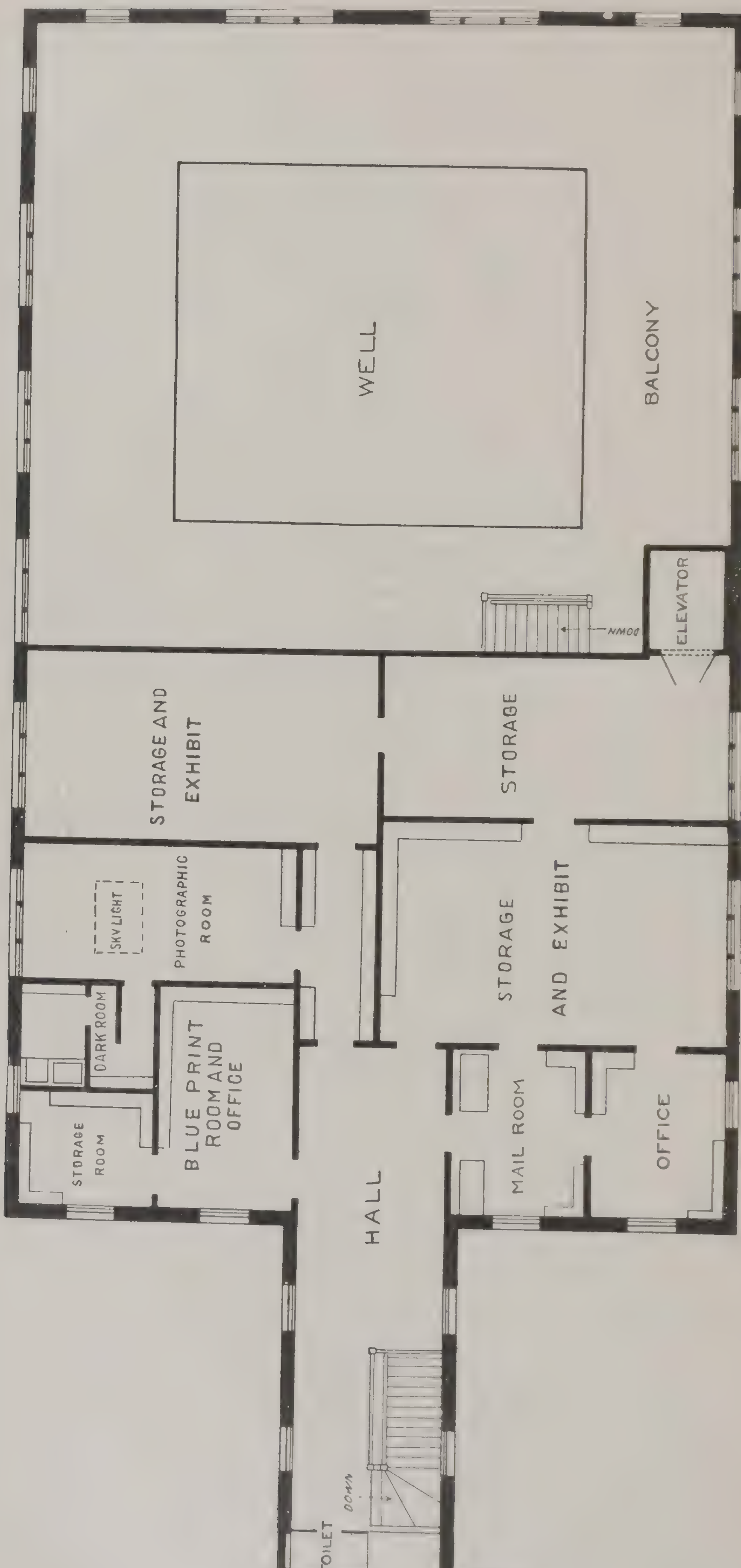

FIG. 7.—Balcony and third-floor plan of the Farm Mechanics' Building.

The building has a large elevator with openings on each floor and balcony. It is very substantially constructed of brick, stone, and steel, and is fireproof throughout. The cost, including heating, plumbing, furniture, and other equipment, will be between $65,000 and $70,000. Those familiar with such buildings state that when completed it will be the best and most thoroughly equipped building for instruction in farm mechanics in this or any other country.

Although this department is new at the college, it already has considerable material in the way of equipment. A 12-horsepower steam engine has been donated by a thrashing-machine company, to be used for instruction purposes, and a wagon company has furnished a farm wagon especially constructed for experimental work. The equipment of this wagon includes 10 sets of wheels of different heights and different widths of tire, to be used in tests to determine the best kinds of wheels for different roads, and sets of roller and ball-bearing axles, which will be tested and compared with the ordinary friction axles to determine the relative draught. The roller bearings were especially manufactured for this wagon and are thought to be the first roller bearings used on a farm wagon. A steel grain tank having a capacity of 150 bushels also goes with the wagon. The department is also provided with a newly-invented dynamometer which registers maximum and minimum draughts on a sheet of paper, and by an ingenious device shows the average draught during the test.

It will be the aim of the department to cooperate with the implement manufacturers in various ways. A friendly spirit has already been exhibited by these manufacturers. Quite a number of machines have already been received from them which will be used for practice work by the students, and many others have been promised as soon as the new building is ready to receive them. Representatives of these implement manufacturers will be invited to lecture before the students in farm mechanics from time to time, explaining in detail the construction of the machines which they are manufacturing, with the aid of specimens of these machines for illustration. In this way it is hoped to obtain for the students the best possible information on implement construction by men who are specialists in their lines.

The aim will be to make the collegiate course thoroughly practical. Students will be trained in the fundamental principles of construction of farm machinery, and in the setting up, operating, and adjusting of various kinds of implements. Besides farm machinery, the department embraces instruction in farm drainage, road construction, irrigation, planning farm buildings, mechanical drawing, carpentering, blacksmithing, and horseshoeing. Courses are provided in farm and field machinery, in farm power machinery, in drainage, and farm buildings, and opportunity is offered for postgraduate work. A number of postgraduate students are taking farm mechanics this year as

a major study, with the expectation of fitting themselves for teaching this subject; and many inquiries are being received from prospective students.

The new department is in charge of Prof. C. J. Zintheo, recently instructor in agricultural engineering at the North Dakota Agricultural College, who was formerly in the employ of a large implement concern, and has had experience in both the practical and theoretical aspects of the subject.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Nitrogen in protein bodies, T. B. Osborne and I. F. Harris (*Jour. Amer. Chem. Soc., 25 (1903), No. 4, pp. 323–353*).—In studying the decomposition products of various protein preparations the authors have obtained fairly uniform results with Hausmann's method, which consists in boiling the sample with strong hydrochloric acid and then determining the nitrogen expelled in the form of ammonia by distillation with magnesia, the nitrogen precipitated by phosphotungstic acid from the ammonia-free solution, and the nitrogen in the filtrate from the phosphotungstic acid precipitate. Tests were made of the method, and under the conditions in which it was used by the authors it is believed to yield valuable comparative results. It has been found that preparations obtained from different sources and previously believed to be the same substance have yielded by this method such different proportions of nitrogen in the several groups as to show beyond doubt that they are entirely distinct; and, on the other hand, confirmatory evidence has been obtained on the identity of other preparations of different origin. The following table indicates the source of the different proteins and summarizes some of the analytical data:

Nitrogen in various protein bodies.

Name and source of protein.	Nitrogen as ammonia.	Basic nitrogen.	Non-basic nitrogen.	Nitrogen in magnesium oxid precipitate.	Total nitrogen.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Globulin (wheat)	1.42	6.83	9.82	0.28	18.39
Globulin (cocoanut)	1.36	6.06	10.92	.14	18.48
Globulin (squash seed)	1.28	5.97	11.04	.22	18.51
Edestin (hemp seed)	1.88	5.91	10.78	.12	18.64
Excelsin (Brazil nut)	1.48	5.76	10.97	.17	18.30
Corylin (hazel nut)	2.20	5.75	10.70	.16	19.00
Globulin (cotton seed)	1.92	5.71	11.01	....	18.64
Globulin (castor bean)	1.96	5.64	11.00	.12	18.75
Corylin (walnut)	1.78	5.41	11.51	.15	18.84
Conglutin (lupin)	2.12	5.20	10.38	.18	17.90
	2.65	5.13	10.30	.14	18.21
Legumin (pea, lentil, horse bean, vetch)	1.69	5.18	10.92	.17	17.97
Globulin (flax seed)	2.00	4.77	11.47	.22	18.48
Vicilin (pea, lentil, horse bean)	1.78	4.75	10.37	.21	17.11
Nucleovitellin (egg yolk)	1.25	4.65	10.16	.22	16.28
Vignin (cowpea)	1.91	4.28	10.81	.25	17.25
Globulin (sunflower)	2.57	4.27	11.52	.24	18.58
Conalbumin (egg white)	1.21	4.16	10.49	.26	16.11
Amandin (almond)	3.05	4.15	11.55	.17	19.00
Phaseolin (kidney bean, adzuki bean)	1.74	3.97	10.18	.29	16.20
Glycinin (soy bean)	2.11	3.95	11.27	.12	17.45
Legumelin (pea, lentil, horse bean, adzuki bean)	1.04	3.71	10.96	.38	16.09
Leucosin (wheat)	1.16	3.50	11.83	.43	16.93
Casein (cow's milk)	1.61	3.49	10.31	.21	15.62
Ovalbumin (egg white)	1.34	3.30	10.58	.29	15.51
Glutenin (wheat gluten)	3.30	2.05	11.95	.19	17.49
Gliadin (wheat, rye)	4.20	.98	12.41	.14	17.66
Hordein (barley)	4.01	.77	12.04	.23	17.21
Zein (corn)	2.97	.49	12.51	.16	16.13

The wide range in the percentages of basic nitrogen in the different proteins is considered the most striking feature shown by these figures. The ammonia also showed marked variations.

Cotton-seed meal and gluten meal examined by the same method showed marked differences in the percentages of nitrogen in the different groups, but the authors suggest that these chemical differences are apparently of but little importance from the standpoint of animal nutrition.

The precipitation limits with ammonium sulphate of some vegetable proteins, T. B. OSBORNE and I. F. HARRIS (*Jour. Amer. Chem. Soc., 25 (1903), No. 8, pp. 837–842*).—In the determinations reported a quantity of protein was dissolved in one-tenth saturated ammonium sulphate solution, the solution filtered, and 2 cc. mixed with enough one-tenth saturated sulphate solution so that when precipitated with a saturated sulphate solution the final volume would be 10 cc. In the following table are given the cubic centimeters of saturated sulphate solution required to first render the solution permanently turbid, to precipitate the bulk of the protein, and to remove all traces of the substance:

Saturated ammonium sulphate solution required to precipitate vegetable proteins.

Name and source of protein.	Lower limit.	Most precipitated.	Upper limit.
	Cc.	*Cc.*	*Cc.*
Globulin (English walnut)	2.8	2.8–4.6	6.6
Globulin (black walnut)	2.8	2.8–4.6	6.6
Edestin (hemp seed)	3.0	3.0–4.0	4.2
Edestin monochlorid	3.0	3.0–3.9	3.9
Globulin (flaxseed)	3.1	3.3–4.6	4.7
Globulin (castor bean)	3.1	3.3–4.3	4.5
Globulin (squash seed)	3.3	3.5–4.1	4.4
Amandin (almond)	3.5	3.5–5.0	5.3
Corylin (filbert)	3.7	3.7–5.3	6.6
Excelsin (Brazil nut)	3.8	4.0–5.0	5.5
Conglutin—less soluble portion (lupine)	4.2	4.3–6.0	7.3
Conglutin—more soluble portion (lupine)	4.6	6.4–8.2	8.7
Globulin (cotton seed)	4.6	5.0–6.0	6.4
Legumin (vetch, lentil, horse bean)	5.4	5.5–6.5	7.5
Phaseolin (kidney bean)	6.4	6.5–8.2	8.8

The specific rotation of some vegetable proteins, T. B. OSBORNE and I. F. HARRIS (*Jour. Amer. Chem. Soc., 25 (1903), No. 8, pp. 842–848*).—The averages of numerous determinations, calculated to degrees of circular polarization, are as follows: Edestin (hemp seed) —41.3, globulin (flaxseed) —43.53, globulin (squash seed) —38.73, excelsin (Brazil nut) —42.94, amandin (almonds) —56.44, corylin (filbert) —43.09, globulin (English walnut) —45.21, globulin (black walnut) —44.43, phaseolin (kidney bean) —41.46, legumin (horse bean) —44.09, zein (corn) —28.00, gliadin (wheat) —92.28.

The globulin of the English walnut, the American black walnut, and the butternut, T. B. OSBORNE and I. F. HARRIS (*Jour. Amer. Chem. Soc., 25 (1903), No. 8, pp. 848–853*).—A study of protein preparations from the nuts of *Juglans regia*, *J. nigra*, and *J. cinerea* showed a close agreement as regards the percentages of nitrogen in the different decomposition products and the specific rotation. The globulins from the different sources are therefore considered identical, and the name juglansin is given them. In comparison with the globulin (corylin) from the filbert the only positive difference was in the greater quantity of ammonia (about 0.4 per cent) yielded by corylin, which has led the authors to conclude that the globulins of Juglans and Corylus are chemically distinct.

The carbohydrate group in the protein molecule, T. B. OSBORNE and I. F. HARRIS (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 474–478*).—The Molisch reaction was not obtained with avenalin, edestin, and globulin, and the reaction with a large number of other vegetable proteins was so slight as to be attributed to a con-

tamination of the preparation with some carbohydrate. "The evidence of a carbohydrate group in the protein molecule which Molisch's reaction affords can not, therefore, be accepted as conclusive, other evidence which shows that more than insignificant quantities of carbohydrate are present being also necessary."

The tryptophane reaction of various proteins, T. B. Osborne and I. F. Harris (*Jour. Amer. Chem. Soc., 25 (1903), No. 8, pp. 853–855*).—The Hopkins-Cole reagent was applied to a number of proteins, 50 mg. of each being mixed with 6 cc. of glyoxylic acid solution and 6 cc. of concentrated sulphuric acid added. The absence of the color reaction was not established in any instance, although in the case of zein it was very slight.

The albuminoid substances in corn, Donard and Labbé (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 4, pp. 264–266*).—The albuminoid material extracted from corn by treatment with potash alcohol was separated into 3 portions, one soluble in amyl alcohol, one insoluble in amyl alcohol but soluble in ethyl alcohol, and one insoluble in both alcohols. The 3 substances are thought to be separated by only slight differences of constitution, such as different degrees of hydration.

The analysis of oils and allied substances, A. C. Wright (*London: Crosby Lockwood & Son, 1903, pp. VI + 241, figs. 5*).—It is stated to be the definite aim of this work to present "the subject in a form suited to the needs of the student and beginner, while at the same time including all recent developments likely to be found of value in practical work. . . . An attempt has been made to indicate the extent to which reliance may be placed on methods for detecting adulteration. It is hoped that the subject has been treated throughout in such a manner that the book may serve as a laboratory guide for chemists who are not extensively engaged in oil analysis, or who have to deal with only a limited number of oils." Different chapters deal with the occurrence and composition of oils, fats, and waxes; the physical properties of oils, fats, and waxes, and their determination; the chemical properties of oils, fats, and waxes from the analytical standpoint; detection and determination of nonfatty constituents; methods for estimating the constituents of oils and fats; description and properties of the more important oils, fats, and waxes, with the methods for their investigation; and the examination of certain commercial products.

Olive oils and olive-oil substitutes, L. M. Tolman and L. S. Munson (*Jour. Amer. Chem. Soc., 25 (1903), No. 9, pp. 954–962*).—Analyses were made of 38 samples of pure California olive oils, the average composition being as follows: Specific gravity at 15.5° C. 0.9168, butyro-refractometer reading at 15.5° C. 69.2, index of refraction at 15.5° C. 1.4711, Maumené number 46.8, specific temperature reaction 101.6, Hübl number 85.1, iodin number of liquid fatty acids 92.8, melting point of fatty acids 22.5° C., free fatty acids as oleic 0.85 per cent. The average composition of 18 samples of pure Italian olive oils was as follows: Specific gravity 0.9163, butyro-refractometer reading 67.8, index of refraction 1.4709, Maumené number 44.9, specific temperature reaction 99.1, Hübl number 81.5, iodin number 94, melting point 25.4, free fatty acids 1.11. Analyses of the following oils are also reported: Cocoanut, palm, lard, peanut, mustard, rape, almond, sunflower, corn, cotton seed, poppy, and linseed.

Does cholesterol occur in olive oil? A. H. Gill and C. G. Tufts (*Jour. Amer. Chem. Soc., 25 (1903), No. 5, pp. 498–503*).—Determinations were made of the melting point of the alcohol obtained from olive oil, from which it is concluded that the substance is phytosterol and not cholesterol.

A modification of the Babcock-Blasdale viscosity test for olive oil, H. Abraham (*Jour. Amer. Chem. Soc., 25 (1903), No. 9, pp. 968–977, figs. 3*).

The viscosity of the soap solution as a factor in oil analysis, H. C. Sherman and H. Abraham (*Jour. Amer. Chem. Soc., 25 (1903), No. 9, pp. 977–982*).

A contribution to the chemistry of rice oil, C. A. Browne, Jr. (*Jour. Amer. Chem. Soc., 25 (1903), No. 9, pp. 948–954*). The constants of rice oil as determined in a sample obtained from rice bran were as follows: Specific gravity 0.8907, melting

free oxid by filtration, and the separate determination of the arsenious oxid in the filtrate and in the residue.

Titration with potassium iodate, L. W. ANDREWS (*Jour. Amer. Chem. Soc., 25 (1903), No. 7, pp. 756–761*).—The method proposed is based upon the titration of potassium iodid, for example, with potassium iodate in presence of a large excess of hydrochloric acid, using chloroform or carbon tetrachlorid as indicator. The author has adapted the method to the determination of iodids, free iodin, chromates, chlorates, antimony, arsenic, and iron. The method "is adapted to the determination of almost all the substances to which Bunsen's process of distillation with potassium iodid and hydrochloric acid is applicable, with at least equal precision, with less expenditure of time and far simpler apparatus. It is furthermore applicable in certain cases in which the Bunsen method is not, as, for example, the titration of arsenic or antimony in the presence of copper and ferric compounds."

Chemistry of dyestuffs, G. VON GEORGIEVICS, trans. by C. SALTER (*London: Scott, Greenwood & Co., 1903, pp. VI+402*).—A translation of the second German edition.

The chemical industry in Germany, E. L. HARRIS (*U. S. Consular Rpts., 72 (1903), No. 275, pp. 527–536*).—Statistical information on this subject.

Report of the senior analyst for the year 1902, C. F. JURITZ (*Cape Town, 1903, pp. 73*).—During the year analyses were made of 1,568 samples, including milk, butter, cheese, coffee, wine, water, soils, fertilizers, coal, etc., the results being reported in this publication and discussed.

BOTANY.

Studies in the Cyperaceæ, T. HOLM (*Amer. Jour. Sci., 4. ser., 16 (1903), No. 91, pp. 17–44, figs. 14*).—The author gives the results of his extended study of the genus Carex as represented in Colorado, giving a synopsis of species and a description, together with critical notes on all material known to exist within that State. In addition he discusses the geographic distribution of the species, comparing the distribution of the sedges from the Arctic region, Europe, and portions of the Rocky Mountains.

Influence of various stimulants on the respiration of plants, V. ZALYESSKI (*Zap. Novo-Alexandri Inst. Selsk. Khoz. i Lyesor, 15 (1903), No. 2, pp. 1–41; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 3, pp. 351, 352*).—After having determined the respiratory energy of gladiolus bulbs, the author made a study of the effect of various stimulants as shown by the modification of their respiration. In the first series the bulbs were subjected to the influence of ether. This was found to act as a marked stimulant, the influence of the ether being shown by a curve which expresses the influence of the ether on the respiration of the bulb, being one of excitation or depression when the respiration was above or below normal. Very large quantities of ether tend to diminish the respiration of the bulbs.

In the second experiment the influence of change of temperature was studied and it was found that transferring the bulbs for 2 hours from a temperature of 16.8° C. to one of from 38 to 38.8° increased the respiration. After a number of days the respiration returned to its normal state. If the bulbs be kept at 38 to 40° for a considerable time the respiration is considerably lowered. This depression, however, is attributed not to the injury caused the bulbs, but to their continued drying. Bulbs so treated, after being placed 4 hours in water, regained their energy of respiration. From this the author is led to conclude that water absorbed by bulbs acts as a stimulus in raising the respiration for a time. Other investigations were carried on to determine the effect of air pressure and the influence of mechanical injuries on plant respiration.—P. FIREMAN.

Stimulants of plant growth and their practical application, O. LOEW (*Landw.*

Jahrb., 32 (1903), No. 3, pp. 437–448, pls. 2).—The results of experiments with different substances, including rubidium chlorid, sulphate of manganese, uranium nitrate, sodium fluorid, calcium iodid and iron sulphate, as stimulants of plant growth, are reported. The experiments were made with barley, rice, peas, oats, *Brassica chinensis*, and radishes, grown in pots and in the field. The data show that these substances have a stimulating effect, and the author believes this to be of value in agricultural practice, but states that through an accumulation of the same in the soil their influence becomes injurious.

The toxic effect of H and OH ions on seedlings of Indian corn, F. A. Loew (*Science, n. ser., 18 (1903), No. 453, pp. 304–308*).—According to the author, attempts have been made within the past 5 years to determine the toxic effect of various chemical solutions upon plant life. This involved the theory of ionization and is based upon the electrical conductivity of the solutions. After discussing some of the theories and previous investigations, the author gives an account of experiments in which the effect of these various dilutions of potassium hydroxid, sodium hydroxid, hydrochloric and sulphuric acid on seedlings of Indian corn was tested.

The test solutions were made in 4 different dilutions, and, after germinating the corn, the sprouted grains were placed in test glasses in such a way that the radicle was held in contact with the solution. The seedlings were then kept in a dark chamber for 24 hours, after which the growth or elongation was noted. The results obtained by the different experiments are shown in tabular form, from which it appears that the corn seedling lived and grew in a 1/128 normal solution of the alkalis and 1/512 normal solution of the acids. This shows that corn seedlings live in an alkali solution more than 3 times as strong and an acid solution 12 times as strong as that in which the seedlings of white lupine live, as previously reported (E. S. R., 11, p. 1100).

The physiological rôle of mineral nutrients in plants, O. Loew (*U. S. Dept. Agr. Bureau of Plant Industry Bul. 45, pp. 70.*)—This is a revised edition of Bulletin No. 18 of the Division of Vegetable Physiology and Pathology (E. S. R., 11, p. 1008), with some additions. The following is added to the final remarks:

"A question of considerable importance for agriculture is the judicial regulation of the lime and magnesia content of the soil, especially when mineral fertilizers are employed. This regulation must be based on the knowledge of the readily assimilated amounts of these bases. Hence only the finer soil particles should serve for analysis. When a soil is much richer in magnesia than in lime extensive liming is necessary. The liming should be done chiefly with the carbonate and only in part with slaked lime and the sulphate. On the other hand, when the magnesia content is much less than that of lime the addition of a powdered magnesian limestone or magnesite is necessary. Burned magnesite and artificially precipitated magnesium carbonate must be avoided under all circumstances, since they are too finely divided and too easily absorbed."

Experiments by May (E. S. R., 13, p. 630) and by Aso and Furuta (E. S. R., 14, p. 14) are cited as having shown that "cereals thrive best when the lime content of the soil only slightly exceeds that of magnesia. Crops having more abundant foliage, however, require considerably more lime. For the most luxuriant development cabbage needs twice as much lime as magnesia, while buckwheat requires three times as much lime as magnesia."

Bacteria and the nitrogen problem, G. T. Moore (*U. S. Dept. Agr. Yearbook 1902, pp. 333–342, pls. 6*).—A review is given of the importance of nitrogen for plant growth and the different sources from which nitrogen is obtained. The assimilation of nitrogen through the root tubercle organisms which are found on the roots of many leguminous plants is discussed, and the results of investigations on the cultivation of this organism for artificial inoculations are briefly described.

The author found that the bacteria could be made to grow on media which did not contain any of the decoctions of the host plant, such as are used in the German

preparations; and a formula of a medium was discovered in which the bacteria grew readily and were capable of active growth when placed in the proper conditions of inoculation. The organisms were found not only to be capable of fixing a large amount of nitrogen, but did not lose this power by prolonged drying. On this account it is possible to distribute the inoculating material, and arrangements have been made for that purpose. A description is given of the methods by which the organism is to be applied to the soil.

ZOOLOGY.

Audubon societies in relation to the farmer, H. OLDYS (*U. S. Dept. Agr. Yearbook 1902, pp. 205–218, pls. 2, figs. 2*).—The author presents a discussion of the value of birds, the danger of their extinction, the objects of Audubon societies, their work in securing and enforcing legislation, and the interest of farmers in bird protection.

Birds in their relations to man, C. M. WEED and N. DEARBORN (*Philadelphia and London: J. B. Lippincott Co., 1903, pp. 380, pls. 20, figs. 95*).—The purpose of this volume is to present a general account of economic ornithology for the United States and Canada. The authors have summarized the work of this Department, the experiment stations, and other institutions in studying the feeding habits of birds. Special accounts are presented of the economic relations of a number of the more important species and families of birds. The authors discuss, also, the methods of protecting game birds and encouraging the presence of birds near orchards and human habitations. In an appendix to the volume, copies are given of the bird law of the American Ornithologists' Union and the Lacey bird law, together with a discussion of the principles of bird laws, and a partial bibliography of the economic relations of North American birds.

Birds and man, W. H. HUDSON (*London: Longmans, Green & Co., 1901, pp. 217*).—A popular and appreciative account of the relationship between birds and man, with particular reference to daws, wrens, ravens, owls, and geese, and with chapters on the birds of London and Selborne.

Birds and horticulturists, H. A. SURFACE (*Pennsylvania State Dept. Agr., Zool. Circ. 1, pp. 12, pls. 3*).—Notes on nesting boxes and other means of encouraging the establishment of bird colonies near houses and cultivated fields. Attention is also called to the economic value of birds and to the necessity for further study of their feeding habits.

Birds versus gardening, C. E. PEARSON (*Jour. Roy. Hort. Soc. [London], 27 (1902), No. 1, pp. 55–60*).—Attention is called to the depredations committed by the various birds on garden crops. The birds which are mentioned as most injurious are the English sparrow, blackbird, linnet, grosbeak, and other members of the sparrow family.

Two years with the birds on a farm, E. H. FORBUSH (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 111–161, pls. 3, figs. 5*).—The studies reported in this paper were made on a farm near Wareham, Mass. Attempts were made to attract birds by distributing suitable food, especially during the winter season, and by the construction of attractive nesting places. Special attention was given to a determination of the effect of seed-eating birds upon the prevalence of weeds. It appeared that a number of common weeds were almost exterminated on the farm on account of the destruction of the seeds by birds. The majority of birds which were kept under observation by the author are believed to do considerably more good than harm upon farms maintained for diversified agriculture. Crows, jays, hawks, cats, and squirrels are considered to be the most important enemies of beneficial birds.

A popular handbook of the birds of the United States and Canada, T. NUTTALL (*Boston: Little, Brown & Co., 1903, pp. LIII [illegible] 90[illegible], pls. [illegible], figs. [illegible]*).—The

present edition of Nuttall's Handbook of Birds has been revised and annotated by M. Chamberlain. The volume is divided into two parts, viz, land birds, and game and water birds. The habits and economic relations of each bird are discussed, in addition to descriptive notes, and an account of variations in distribution.

Ornithology, M. W. DOHERTY (*Ontario Agr. Col. and Expt. Farm Rpt. 1902, pp. 30–32*).—The author presents a table of notes on the migration of a number of species of birds.

The best method of poisoning small birds, B. C. ASTON (*New Zealand Dept. Agr. Leaflets for Farmers, No. 66, pp. 3*).—For destroying the English sparrow and other birds which are injurious to grain, the author recommends the use of wheat dampened with milk and sprinkled with powdered strychnin.

Food habits of the common garden mole, L. L. DYCHE (*Trans. Kansas Acad. Sci., 18 (1901–2), pp. 183–186*).—The author examined the stomach contents of 67 moles taken at various seasons throughout the year. Earthworms were found to constitute 42 per cent of the entire food. The moles had eaten myriopods, grasshoppers, insect eggs and larvæ of various kinds, as well as ants and other adult insects. About 4 per cent of the food taken by the moles was of vegetable origin. This included the seeds of grass, hemp, and other plants, as well as small quantities of corn.

Annual report of the New York Zoological Society for 1902 (*New York: Zool. Soc., 1903, pp. 205, pls. 41, figs. 15*).—The executive committee, of which H. F. Osborn is chairman, presents a report of the general management, equipment, scientific work, and publications of the society (pp. 33–49). W. T. Hornaday, director of the zoological park, gives a report on the mammals, birds, reptiles, administration, and miscellaneous work connected with the zoological park (pp. 56–79).

H. Brooks, pathologist of the zoological park, gives an account of the diseases which prevailed among the animals of the park during 1902 (pp. 101–120). Deaths were most frequent among the primates, 67 out of 170 deaths having occurred in this group. Of the 67 deaths, 30 were from tuberculosis. Notes are also given on pneumonia, gastro-enteritis, parasitic diseases, actinomycosis, distemper, rabies, and on the pathological effects of captivity on wild animals. As chief among the effects of captivity, the author mentions fatty degeneration and certain changes in the blood vessels. The annual report of the veterinarian is presented by F. H. Miller (pp. 131, 132). Distemper occurred in 10 animals, while actinomycosis was observed in 4 antelopes. The affection was believed to have spread from a specimen captured in Montana. Notes are also given on the recurrence of Miescher's sacs, *Trichodectes cervus*, and blood filaria in sea lions.

W. R. Blair discusses the modes of tubercular infection in wild animals in captivity (pp. 133–136). It is believed that in a large percentage of cases infection takes place by inhalation rather than by ingestion. The alimentary tract apparently becomes affected secondarily. The same author presents a report on cysticerci in wild ruminants (pp. 137–144). The following articles in the report may also be mentioned: Observations on the Development of Reptiles, by R. L. Ditmars (pp. 145–153); Some Notes on the Psychology of Birds, by C. W. Beebe (pp. 154–159); The Home of the Giant Tortoise, by R. H. Beck (pp. 160–174); The Caribou, by M. Grant (pp. 175–196).

The monthly bulletin of the division of zoology, H. A. SURFACE (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 1 (1903), No. 5, pp. 32, pls. 2*).—Brief notes are given on plant diseases, method of preparing ammoniacal solution of copper carbonate, insects injurious in September, peach diseases, preservation of robins, flies on live stock, Pennsylvania law against peach yellows, peach rosette, and other diseases, gapes in fowls, San José scale, relation of forestry and zoology, and the destruction of burrowing animals by fumes.

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev., 31 (1903), Nos. 4, pp. 165–216, figs. 7, charts 10; 5, pp. 217–258, figs. 3, charts 22; 6, pp. 259–307, figs. 10, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of April, May, and June, 1903, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 4.—Special contributions on The Water Equivalent of Snow on Ground, by C. A. Mixer; River Floods and Melting Snow (illus.), by C. A. Mixer; Typical October Winds on Our Atlantic Coast, by T. H. Davis; The Franco-Scandinavian Station for Aerial Soundings, by L. Teisserenc de Bort; Note on the Radiation Formulas and on the Principles of Thermometry, by E. Buckingham; The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal; The Fulton Automatic River Gage at Chattanooga, Tenn. (illus.), by W. M. Fulton; and Antarctic Research; and notes on climatic factors in railroad engineering, meteorological expedition to the Bahamas, and Weather Bureau men as instructors.

No. 5.—Special contributions on March and Winter Winds (illus.), by W. B. Stockman; A Waterspout off Hatteras, by T. B. Harper; High Winds at Point Reyes Light, Cal., by W. W. Thomas and A. G. McAdie; Lantern Slides, by O. L. Fassig; Meteorological Observations Obtained by the Use of Kites off the West Coast of Scotland, 1902, by W. N. Shaw and W. H. Dines; A Curious Coincidence—Is it Accidental or Governed by Law [Periodicity in Rainfall and Pressure at Seattle, Wash.]? by G. N. Salisbury; Atmospheric Electricity Considered from the Standpoint of the Theory of Electrons, by H. Ebert; Abnormal Variations in Insolation, by H. H. Kimball; Hailstorms in Porto Rico (illus.), by W. H. Alexander; and Stages of the Mississippi River at Vicksburg, by W. S. Belden; and notes on cold weather in the Arctic and temperate zones, meteorology at the next meeting of the French association, exhibition of meteorological apparatus at Southport, England, international aerial research, and currents in Sandusky Bay.

No. 6.—Special contributions on "La lune mange les nuages"—A Note on the Thermal Relations of Floating Clouds (illus.), by W. N. Shaw; Tornado at Gainesville, Ga., June 1, 1903 (illus.), by J. B. Marbury; Weather Reports from Vessels at Sea, by A. G. McAdie; The Earthquake of June 2, 1903, at Washington, D. C., by C. F. Marvin; Autumnal Coloration of Foliage, by A. F. Wood; The Weather Bureau Seismograph (illus.), by C. F. Marvin; and Observations of Solar Radiation with the Angstrom Pyrheliometer, at Providence, R. I. (illus.), by H. N. Davis; and notes on Weather Bureau men as instructors, the climate and the sugar beet, and the moon's influence on the weather.

Storms of the Great Lakes, E. B. GARRIOTT (*U. S. Dept. Agr., Weather Bureau Bul. K, pp. 9, charts 968*).—This bulletin consists of "charts that describe graphically 238 of the more important storms that visited the Great Lakes during the 25-year period 1876 to 1900. The purpose of the compilation is to furnish observers of the Weather Bureau and shipmasters a handy reference which will aid them to recognize on the daily weather maps the general atmospheric conditions that attend the approach of lake storms."

The climate of Illinois, J. G. MOSIER (*Illinois Sta. Bul. 86, pp. 45–76, figs. 2*).—This is a summary of climatic conditions in different districts of the State compiled largely from the records of the United States Weather Bureau. The general summary given is in part as follows:

"The rainfall for the northern district is 33.48 in., the least being 21.46 in. in 1891, the greatest being 47.22 in. Seventeen and four-tenths per cent of the rain falls in winter, 28.1 per cent in spring, 31.9 per cent in summer, and 22.6 per cent in autumn.

May is the wettest month. The rainfall of the central district is 38.01 in. The least rainfall was 22.85 in. in 1879, the greatest, 48.67 in. in 1876. Eighteen and eight-tenths per cent of the total rainfall occurs in winter, 29.7 per cent in spring, 28.9 per cent in summer, and 22.6 per cent in autumn. May has heaviest rainfall. The rainfall of the southern district is 42.19 in. The least was 30.05 in. in 1872, the greatest, 55.68 in. in 1882. About 21.6 per cent falls in winter, 30.6 per cent in spring, 26 per cent in summer, and 21.8 per cent in autumn. March has most rain.

"The average rainfall for the State is 37.39 in. The least was 25 in. in 1901, the greatest, 47.39 in. in 1898. Six northern counties have 11.3 in. less than seven southern counties. The Ozark Ridge in the southern part of the State makes the rainfall of the counties in which it is situated 7.15 in. more than those immediately above the ridge. A rainy region is situated along the Wabash River up as far as Crawford County. The average temperature for the State is 52.3° F. Northern tier of counties 46.9°, southern counties 57.6°. Northern summers are 7° cooler than southern, while northern winters are 17.2° cooler.

"The average temperature for the northern district is 48.9°. January is the coldest month, 22.1°; July is the hottest, 74.6°. Lowest temperature recorded, 31° below zero. The extreme range of temperature is 143°; average annual range about 115°. Highest temperature in summer of 1901. The average temperature for the central district is 52.7°, the extreme range being 139°; the average annual range being about 109°. Lowest temperature recorded was 28° below zero in 1884; highest, 112° in 1901. The average temperature for the southern district, 55.9°. Lowest temperature observed was 23° below zero, in February, 1899, the highest being 115° in 1901. Extreme range is 138°, with average annual range about 103°.

"The average date for the last killing frost in spring is 15 days later in northern than in southern part, and the date for the first killing frost in fall is 12 days earlier than in the southern. The difference between dates of last killing and first killing frosts for extreme parts of State is 40 days.

"November, December, January, February, March, and April are the cloudy months of the year, being cloudy for 56 per cent of the daylight in the northern, 53½ in each of the other sections. The other months of the year are less cloudy, having 45½ per cent in the northern, 40½ in the central, and 42 per cent in the southern. December is the cloudiest month for the northern and southern parts, and March for the central part."

Wet and dry seasons in California, A. G. McAdie (*U. S. Dept. Agr. Yearbook 1902, pp. 187–204, pl. 1, figs. 7*).—The available data for rainfall during the rainy season are compiled and discussed with reference to permanent change or periodicity in rainfall. "There does not appear to be any evidence of a permanent change in climate. Wet and dry seasons come and go with little regularity. A deficiency in rainfall seldom extends over two seasons, and the same is true of excessive rainfall."

Rainfall and irrigation, E. A. Beals (*U. S. Dept. Agr. Yearbook 1902, pp. 627–642, figs. 6*).—A discussion of the amount and distribution of rainfall in different parts of the world with reference to the utilization of the water in irrigation.

Climate of the forest-denuded portion of the Upper Lake region, W. L. Moore (*U. S. Dept. Agr. Yearbook 1902, pp. 125–132, pl. 1*).—"The distinguishing features of the climate of the Upper Lake States may be summed up about as follows: The winter climate is cold and dry, but there is considerable snow in the northern and eastern districts. The transition seasons, spring and autumn, are characterized by frequent alternations of clear, fair skies and cloudy, rainy, or snowy weather. The fluctuations of temperature are at times sharp. The summer is warm, with long days and short, cool nights. The rainfall is generally fairly abundant and much more constant than is the case to the west and southwest. The hot, desiccating winds that so often wither and kill the growing crops of the Lower Missouri and

Central Mississippi valleys are entirely absent. The air is healthful and physically invigorating to a remarkable degree."

Psychrometric observations in the forest and in the steppe, N. Adamov (*Trudi. Opuitn. Lyesn., 1902, No. 1; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, pp. 249, 250*).—The author reports the results of preliminary observations made with the aid of a psychrometer on the distribution of heat and humidity in fields and woods, at the surface of the soil and at a height of ⅔ ft., and also in the tops and over the tops of trees. The results are not conclusive, but indicate that, on open fields and clearings in the woods, the air is somewhat warmer than in the forest, while the humidity is, on the contrary, somewhat greater in the forest than on the field.—P. FIREMAN.

Observations on the humidity of the air, T. O. Frizendorf (*Khozyain, 1902, No. 49; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, p. 251*).—The author, on the basis of observations extending over 4 years, recommends Treska's method of forecasting, which is as follows: If the temperature of the dew-point is higher than the mean temperature of the day a frost may be expected; if it is zero there will be a thunderstorm; if it is greater than zero and less than 3 there will be rain, a difference greater than 3 and less than 6 indicates more or less cloudiness; if the difference is equal to 6 fine weather may be expected; if it is 7 to 8 a strong windstorm is probable. A barometric rise and an east wind increase the chances of fine weather, while a barometric fall and a west wind lower the chances.—P. FIREMAN.

Spring frost in the Mediterranean climate, M. Chassant (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 2 (1903), No. 4, pp. 291–323, pls. 6*).—This is a record of observations made at the meteorological station of the national school of agriculture at Montpellier during the period from 1893 to 1902. The general characteristics of the climate of the Department of Herault, in which Montpellier is situated, are discussed. These are droughts and prolonged high temperatures in summer, irregularity of rainfall, and extremes of temperature observed during some years, sometimes in winter, sometimes in summer. The observations which are summarized include temperature, pressure, direction and velocity of wind, and cloudiness. The larger proportion of the frost observed occurred during periods of low pressure. The frosts were, it is claimed, a result of a current of cold air which acted in conjunction with nocturnal radiation.

WATER—SOILS.

The contamination of public water supplies by algæ, G. T. Moore (*U. S. Dept. Agr. Yearbook 1902, pp. 175–186, pls. 2*).—The importance of a more careful microscopic study of water with reference to wholesomeness is pointed out, and plant and other organisms affecting the color, taste, or odor of water are discussed, particular attention being given to the structure, multiplication, and effects on water of Spirogyra of the Chlorophyceæ, blue-green algæ (Schizophyceæ), Diatomaceæ, and Syngeneticeæ. Methods of preventing pollution, including covering reservoirs, keeping water free from organic matter, aeration, etc., are briefly described.

Potable waters, L. Grandeau (*Jour. Agr. Prat., n. ser., 5 (1903), No. 24, pp. 753, 754*).—A brief general discussion of the qualities which potable water should possess.

On the rate of movement of underground waters, E. Fournier and A. Magnin (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 14, pp. 910–912*).—Experiments with fluorescein, salt, starch, etc., in the region of Jura are reported. Among the facts brought out is that fluorescein is diffused more slowly than are cultures of micro-organisms and other contaminating agents.

Analysis of waters and interpretation of the results, J. K. Haywood (*U. S. Dept. Agr. Yearbook 1902, pp. 283–294*).—The significance of the various determinations made in sanitary and mineral analysis of water, and analysis of water for irrigation and boiler purposes is explained.

The soil: An introduction to the scientific study of the growth of crops, A. D. HALL (*London: J. Murray, 1903, pp. XV + 286, pls. 13, figs. 4*).—The author states in his preface that this book "is primarily intended for the students of our agricultural colleges and schools, and for the farmer who wishes to know something about the materials he is handling day by day. While a certain knowledge of chemistry is assumed, it is hoped that the subject is so treated as to be intelligible to the non-technical reader who is without this preliminary grounding. Though the book is in no sense an exhaustive treatise, it has been my desire to give the reader an outline of all the recent investigations which have opened up so many soil problems and thrown new light on difficulties that are experienced in practice."

The subject of soils is treated in its chemical, physical, and biological relations, and different chapters discuss the origin of soils, the mechanical analysis of soils, the texture of the soil, tillage and the movements of soil water, the temperature of the soil, the chemical analysis of soils, the living organisms of the soil, the power of the soil to absorb salts, causes of fertility and sterility of soils, and soil types. Appendixes give chemical analyses of typical soils, and a classified bibliography of some of the more important works on soils.

The subject is discussed, of course, mainly from the standpoint of British conditions, but the results of European and American investigations are drawn on freely, but discriminatingly.

The book is notable not only for its general excellence, but because it has none of the staleness of a mere compilation; but possesses the originality and suggestiveness to be expected in the work of an author so actively interested, as teacher and investigator, in the subjects discussed.

Report on composition of muskeg soils, H. SNYDER (*Minnesota Sta. Bul. 81, pp. 234–238*).—Descriptions and chemical analyses of 10 samples of muskeg (peaty) soils are given. All the samples were decidedly acid, high in organic matter and nitrogen, and low in mineral matter. Suggestions are made regarding the treatment of the soils under cultivation.

Agricultural soils of the Province de la Union, C. W. DORSEY (*Philippine Bureau Agr. Bul 1, pp. 12, pls. 4*).—The physiography and soils of the province are described, together with the crops generally grown.

The amounts of readily water-soluble salts found in soils under field conditions, F. H. KING (*Science, n. ser., 18 (1903), No. 454, pp. 343–345*).—It is shown that by drying soils at a temperature of 110 to 120° C. a much larger amount of soluble salts is obtained than is yielded by the same soils fresh from the field, the amounts in some cases being more than trebled. The causes of this are discussed. The readily water-soluble constituents in the first, second, third, and fourth feet of a Wisconsin soil unfertilized and receiving different amounts of manure and guano are reported, showing the comparatively large amounts of soluble salts carried by ordinary soils.

The nitrogen compounds of arable soils, G. ANDRÉ (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 13, pp. 820–822*).—In continuation of previous investigations (E. S. R., 14, p. 1056) the author determined the total and ammoniacal nitrogen (by the methods used in previous investigations) in soil from the surface and at depths of 35 to 65 cm. on April 1 and 16, and October 27, 1902, and October 25, 1901. The largest amount of ammoniacal nitrogen was found in the lower layers of the soil in spring.

Nitrification as dependent upon organic and humified substances, SMIRNOV (*Mater. Izuchen. Russ. Pochv, No. 14, pp. 1–19; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4 (1903), No. 1, p. 117*).—The author observed the progress of nitrification in 4 soils containing different amounts of humus (from 0.42 to 3.55 per cent). In all cases a certain regularity was noted in the accumulation of nitric acid, depending upon the time and upon the amounts of humus. Thus, in the soil with 0.42 per

cent of humus and containing 1.5 mg. of nitric nitrogen per 100 gm. of soil there was found after 19 days 14 mg., after 36 days 25.5 mg., and after 73 days 28 mg. In the soil with 3.55 per cent of humus containing 0.5 mg. of nitrate nitrogen there was found after the same lengths of time 21, 38.5, 50.5, and 53 mg. per 100 gm. of soil.—P. FIREMAN.

Influence of protecting forest strips on the moisture of the soil of the surrounding area (*Trudi. Opuitn. Lyesn., 1902, No. 1; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1902*), *No. 2, pp. 248, 249*).—Observations on the area between 2 forest strips were carried out during 3 years, from 1899 to 1901. For the determination of the moisture, samples were taken at different depths from 10 to 600 cm. in the middle of the strips, and at distances of 14, 35, 70, 140, and 665 ft. from them. On the basis of a large number of determinations, the author arrives at these tentative conclusions:

(1) Protecting strips at the age of 6 to 8 years have a positive influence on the increase of the moisture of the soil and subsoil of the adjoining field at a distance not exceeding 70 ft. (2) This influence is the strongest in the spring after the thawing of the snow, is still perceptible in the dry period of the summer, and gradually weakens toward the fall. (3) The influence of the protecting strips on the increase of the humidity of the adjoining field is explained by the snow-accumulating capacity of the strips, in consequence of which a heavy snow cover is retained not only inside the strips, but also along their borders to a distance of about 70 ft.—P. FIREMAN.

Soil, cultivation, and irrigation, W. MAXWELL (*Queensland Agr. Jour., 12* (*1903*), *No. 6, pp. 384–397*).—A general discussion with special reference to Queensland conditions.

Crops used in the reclamation of alkali lands in Egypt, T. H. KEARNEY and T. H. MEANS (*U. S. Dept. Agr. Yearbook 1902, pp. 573–588, pls. 4, figs. 2*).—Notes are given on the climate, soils, irrigation work and methods, methods of reclaiming alkali, and crops used in the process of reclamation in Egypt. The latter include barnyard grass (*Panicum crus-galli*), sorghum, rice, samar (*Cyperus laevigatus*), berseem or Egyptian clover, and cotton. "Of the crops used for the specific purpose of aiding in reclaiming alkali lands in Egypt, probably only two, sorghum and berseem, will be found practically useful in the United States."

FERTILIZERS.

Influence of applications of straw on the yield, D. N. PRYANISHNIKOV (*Vyestnik Selsk. Khoz., 1902, No. 52, pp. 3, 4; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt Landw.*], *4* (*1903*), *No 1, p 89*).—Finely cut straw was mixed with soil in pots at rates of $\frac{1}{4}$, $\frac{1}{2}$, and 1 per cent of the weight of the soil taken (4.5 kg.). The yields of barley and oats obtained decreased uniformly with the increase of straw applied.—P. FIREMAN.

Gypsum as a means of fixing ammonia in the decomposition of manure, S. A. SEVERIN (*Syesd. Dyeat. Selsk. Khoz. Opuitn. Dyelu., St. Petersburg, 1902, Dec., pt. 1, pp. 124–132; abs. in Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 1, pp. 88, 89*).—In laboratory experiments by the author with unsterilized and sterilized manure (inoculating in the latter case with pure cultures of organisms capable of inducing ammoniacal fermentation as well as with a water extract of manure) the addition of 4 per cent gypsum to the manure intensified the decomposition of the manure 10 to 20 per cent, and at the same time preserved the manure from the loss of ammoniacal nitrogen.—P. FIREMAN.

Fertilizing with sulphate of ammonia and organic nitrogen in comparison with nitrate of soda, P. WAGNER ET AL. (*Arb. Deut. Landw. Gesell., 1903, No. 80, pp. 340*).—This is a detailed account of pot and field experiments made at the Darmstadt station and on a uniform plan by a number of cooperating experiment stations in different parts of Germany. The nitrogenous fertilizers employed included nitrate

of soda, sulphate of ammonia, guano, ground bone, dried blood, cattle manurend, a a number of other organic forms of nitrogen.

It was found in the pot experiments that 100 parts of ammoniacal nitrogen yielded 93 parts of nitric nitrogen in the soil. The average results of the pot experiments showed that the different nitrogenous fertilizers were utilized by crops in the following relative proportions: Nitrate of soda 100, ammonium salts 94, Damarara guano 91, Peruvian guano 87, green manures 77, horn meal 74, dried blood 73, castor pomace 73, poudrette (Bremen) 60, Krottnauer manure 51, Blankenburger manure 49, wool dust 26, concentrated cattle manure 22, ground leather 16, sea ooze 12, sediment from settling reservoirs 10. In experiments with oats, ammonium salts were 98 per cent as effective as nitrate of soda in producing grain and 97 per cent as effective in producing straw. It appears also from the results of experiments with oats, beets, and carrots that soda had a decided effect in increasing the yield.

In the field experiments with barley, oats, wheat, rye, potatoes, and beets the relative effectiveness of nitrate of soda and ammonium sulphate was as 100 : 70. The lower effectiveness of the latter is attributed to loss of nitrogen in form of ammonia. In the field experiments, as in the pot experiments, it was found that soda produced a decided effect in increasing yields and that nitrate of soda and sulphate of ammonia produced the same relative proportions of straw and grain or leaves and roots. The possible injurious effect on the physical properties of soils of the continued use of sodium salts, like nitrate of soda, is cautioned against.

The method of making the field experiments is fully described.

The effects on plants of a deficiency of nitrogen, phosphoric acid, or potash, H. WILFARTH and G. WIMMER (*Jour. Landw., 51 (1903), No. 2, pp. 129–138, pls. 3*).—A summary is given of the results of pot and field experiments extending over several years with potatoes, sugar beets, tobacco, buckwheat, and a number of other plants, including fruit trees. The pot experiments were made by the method followed at the Bernburg experiment station,[a] using pure sand mixed with 6 per cent of purified peat.

It was observed that a marked deficiency of any of the essential fertilizing constituents resulted not only in a decrease in yield, but often in some change in the percentage composition of the plant substance. The latter effect was most marked in the carbohydrates in case of a deficiency of phosphoric acid. With a marked deficiency of nitrogen, the percentage of carbohydrates was oftener higher than lower. With a deficiency of phosphoric acid there was a small decrease. Thus sugar beets insufficiently supplied with nitrogen contained a larger percentage of sugar than those abundantly supplied, while a deficiency of phosphoric acid resulted in a reduced percentage of sugar.

The effect of a deficiency of one or the other of the essential fertilizing constituents was also shown in the relative proportion of roots and leaves, as in sugar beets, but especially in the appearance of the leaves. Observations on the latter point are recorded in detail and it is claimed that in case of sand and water cultures the leaf appearance furnishes a reliable means of determining whether the plant needs nitrogen, phosphoric acid, or potash. The indications are not so reliable in case of field experiments.

The leaves of plants suffering from nitrogen hunger were light-green to yellowish, finally drying to a light brownish-yellow color. With a deficiency of phosphoric acid the leaves were deep green, but showed black spots beginning on the edges but spreading over the whole leaf, which finally dries up to a dark brown or dark green color. In cases of very severe phosphoric acid hunger the leaves of sugar beets curl under from the tips, but as a rule the leaves of plants suffering from nitrogen and phosphoric acid hunger are of normal shape and general appearance, although reduced in size.

[a] Arb. Deut. Landw. Gesell., Nos. 34 and 68.

The effects of potash hunger which are especially characteristic have been described elsewhere in the Record (E. S. R., 13, p. 1030).

The effects produced by plant food deficiencies are very similar in many cases to those produced by insects or fungus diseases or by injurious gases.

A process for making available phosphates, C. H. DEMPWOLF, Jr. (*Jour. Amer. Chem. Soc., 25 (1903), No. 8, pp. 818–825*).—An account is given of experiments undertaken with a view to utilizing niter cake, a by-product of the manufacture of sulphuric acid, in the production of available phosphate from bone ash and rock phosphate. By heating the phosphate with niter cake and charcoal, as high as 73 per cent of the phosphoric acid was rendered available. By treating ground rock phosphate with niter cake in solution and allowing to stand for 4 weeks, about 55 per cent of the phosphoric acid was rendered soluble in water. The latter method is considered the more practical from a business standpoint.

Frost and potash fertilizers, A. COUTURIER (*Jour. Agr. Prat., n. ser., 6 (1903), No. 30, pp. 118, 119*).—Various observations are reported to show that crops fertilized with potash fertilizers are more resistant to frost than those not so treated.

Analyses of fertilizing substances sent on for free examination, C. A. GOESSMANN (*Massachusetts Sta. Bul. 89, pp. 3–8, 12–15*).—Analyses are reported of miscellaneous materials, including wood ashes, ground fish bone, tankage, dissolved boneblack, acid phosphate, complete fertilizers, high grade sulphate of potash, nitrate of soda, cotton-seed meal, acetylene gas tank refuse, cocoanut fiber pith, sewage, and soils. Notes are also given on the valuation of fertilizers, and on taking samples for analysis.

Tabulated analyses of commercial fertilizers, J. HAMILTON and W. FREAR (*Pennsylvania State Dept. Agr. Bul. 109, pp. 208*).—Analyses and valuations of 450 samples of fertilizers examined during the year ended December 31, 1902, are reported and discussed.

Fertilizers, R. E. ROSE and E. E. MCLIN (*Florida Dept. Agr. Mo. Bul., 13 (1903), No. 83, pp. 17–35*).—Notes on valuation and tabulated analyses.

FIELD CROPS.

Review of the work of the Northeast Experiment Farm since its organization in May, 1896, H. H. CHAPMAN (*Minnesota Sta. Bul. 81, pp. 181–234, pl. 1, figs. 7*).—A brief description is given of the equipment and improvements of this experiment farm, located at Grand Rapids, which is a branch of the Minnesota Station; and the results obtained since its establishment are reported and discussed in detail. Directions for the culture of the different crops here dealt with are also given.

In a 6-year test of 7 varieties of oats, Improved Ligowo led in productiveness with a yield of 49.8 bu. per acre, followed, in the order given, by Lincoln, Early Gothland, Early Swedish, White Russian, Archangel, and White Wonder. The average yield of all varieties was over 44 bu. per acre. The yields for 1901 and 1902 of 20 new varieties are also shown in comparison with the yields of 9 of the best old kinds. Many of the new varieties were introduced by this Department, and are showing superior quality and productiveness. The results with different methods of soil preparation for oats were in favor of fall plowing. In one experiment the seed of the same variety grown continuously at the farm was compared every year with seed of the same variety grown at the State experiment station. During the 4 years this test has been in progress the seed from the experiment station has outyielded the home-grown seed by an average of 7.9 bu. per acre.

Eleven varieties of wheat grown for 5 years have given an average yield of 17.4 bu. per acre. In 1902, 4 varieties of macaroni wheat gave an average yield of 15.4 bu. per acre, as compared with 22.3 bu. for the ordinary wheats. The blue stem wheats

have so far given the largest yields at the farm. The author recommends not to sow wheat on spring-plowed land. A yield of 22.9 bu. per acre of winter wheat is reported.

The 6-rowed varieties of barley have given the best results. Manshury, one of the best varieties of this type, averaged 24.9 bu. per acre for 7 years, and Champion of Vermont, the best 2-rowed sort, gave an average yield of 21.6 bu. per acre.

The average length of the growing period for different grains as observed at the farm for 7 years was as follows: Barley 93 days, oats 109 days, and wheat 113 days.

The results with spelt, winter rye, flax, buckwheat, and beans are briefly noted. The experience with spelt was not encouraging. Winter rye gave good results and during 6 years was never injured by winterkilling.

The results for grasses, clover, and alfalfa, grown alone and in mixtures, are tabulated and comments on the value of the different crops for the region are given. Red clover grown separately or in combination with grasses has given good results, but alfalfa in 3 trials never survived the winter. Among the mixtures the high yields, in each case over 4 tons of hay per acre, are recorded for red clover with brome grass and timothy, red clover with redtop and timothy, and red clover with wheat grass.

Forage crops dealt with in this connection are corn, millet, and peas. In 1901 a yield of 5.05 tons of corn fodder was obtained per acre. Dent corn varieties maturing in southern Minnesota and northern Iowa are recommended for fodder in the region in which the farm is located. The results with a number of flint and dent corn varieties are given. Of the flint varieties Squaw, North Dakota White, and North Dakota Yellow ripened in the locality. The dent corn varieties usually did not mature. Japanese was the most productive of the different varieties of millet grown, but its coarseness is regarded as detrimental to its feeding value. The difference in yield between German, Common, Siberian, and Hungarian millets was not very large. On light sandy soil in 1896 peas yielded from 8 to 13.5 bu. per acre, and in 1898 on bottom land underlaid with clay the yield was from 15 to 28.8 bu.

Potatoes at the farm grew best on light sandy or sandy loam soils. In a test of 48 varieties for 2 years Early Michigan led with a yield of 346.3 bu., and Salzer Million Dollar, which ranked last, produced only 132.3 bu., or 214 bu. per acre less than the best yielding sort.

Of the root crops grown ruta-bagas have uniformly given the largest yields and have shown themselves adapted to the largest range of soil conditions. The average yield of 4 varieties in 1900 was 24 tons per acre, while 6 varieties of mangels, 2 of sugar beets, and 4 of carrots averaged 17.6, 13.3, and 7.2 tons per acre, respectively. Root crops, owing to weather conditions, have not been uniformly successful at the farm.

Outlines of rotation experiments in progress and notes on the clearing of lands are given, and the swamp lands of the region are described.

Other parts of this bulletin are noted elsewhere.

Practices in crop rotation, G. K. Holmes (*U. S. Dept. Agr. Yearbook 1902, pp. 519–532*).—A general review of past and present practices in crop rotation is given and the more common rotations in which specified crops are grown in different States are outlined. Various factors affecting crop rotation are discussed.

Crop rotation for South Dakota, E. C. Chilcott (*South Dakota Sta. Bul. 79, pp. 69, figs. 9*).—In connection with an outline of the experiments conducted and a report on the results obtained, chemical and mechanical analyses of soil from the station plats and the meteorological records for the growing season for each year from 1897 to 1902, inclusive, are presented. The experiments comprise 24 rotation tests, and the results of each test are briefly discussed. The moisture and fertilizer requirements of the different crops grown are compared. The average yield of all wheat plats for 5 years was 14.47 bu. of grain and 2,292 lbs. of straw per acre, and

this is taken as the standard of comparison for the different rotations. The average yield of oats was 43.64 bu. of grain and 2,231 lbs. of straw, and of barley 37.25 bu. of grain and 1,963 lbs. of straw. In these average results the ratio of grain to straw for wheat, oats, and barley was 1:2.65, 1:1.58, and 1:1.15, respectively.

The best average yields were obtained from wheat following summer fallow, but the difference in yield as compared with wheat following corn amounted to only ⅓ of a bushel per acre, and for this reason the rotations containing corn crops are regarded as much more profitable than those with summer fallow. The lowest yields of grain and straw were obtained where wheat followed oats. The yields of wheat after millet were below the general average, and on account of this fact millet is regarded as having but little value as a restorative crop. Wheat after peas also yielded less than the general average, and where the peas were plowed under for green manure the yields were not as good as where corn had been grown the previous year. Continuous cropping with wheat resulted in an average yield of about 1.5 bu. per acre below the standard. Wheat after roots gave about the same results as after corn, and when grown after vetch the yields were slightly better than when following peas.

The value of brome grass in the rotation is pointed out, and directions for its use and treatment in this connection are given.

The effects of growing corn on succeeding crops are summarized as follows:

"The soil is kept in the best condition for the growth of nitrifying and other beneficial bacteria.

"Chemical changes, in part dependent upon, and in part independent of, the growth of bacteria are induced; thus reducing the unavailable plant food to forms in which it can be readily assimilated by the growing plants.

"The soil moisture is conserved and kept stored in the soil for the use of the succeeding crop instead of being evaporated from the surface.

"A less amount of moisture is used by the corn crop than by any of the other crops under consideration; and, therefore, a larger store of soil water is available for the succeeding crop."

The seasons of 1900 and 1901 represented unfavorable and favorable conditions, respectively, and a comparison is made of the effects upon the yields of wheat and oats produced by the immediately preceding crop during these seasons. In 1900 the average yield of wheat from 30 plats was only 9.15 bu. per acre, while in 1901 from the same plats and in the same rotations it was 16.38 bu. The average yield of oats from 8 plats was 20.69 bu. per acre in 1900 and 47.87 bu. in 1901. An increase in yield of 8.04 bu. per acre was obtained where wheat followed summer fallow, corn, potatoes, or peas plowed under, and an increase of 16.12 bu. of oats where this crop was grown after corn instead of after wheat. The yields of both crops in 1901 were quite uniform, and there was no apparent advantage in growing wheat on summer fallow or corn land during this favorable season.

In observing the effects of the frequency of cropping with wheat the author found that where wheat was grown only once in 5 years the average yield was 15.27 bu.; and where grown every 2 years, 15.33 bu. per acre. The yields in the other groups differed from each other by less than 1 bu. per acre, and were considerably less than for the 2 and 5 year periods. The failure to detect any relation between the length of the interval between wheat crops and the yields strengthens the author's former conclusion that the yields depend almost entirely upon the crop immediately preceding the wheat crop.

In addition to the report on the rotation tests the results of experiments in the application of manure to wheat are given. The quantities of manure applied ranged from 4,000 to 9,600 lbs. per acre. In 1897 the average increase on the manured plats was 1.9 bu. and in 1898 2.99 bu. These results proved profitable.

Industrial progress in plant work, B. T. GALLOWAY (*U. S. Dept. Agr. Yearbook 1902, pp. 219–230*).—This paper briefly reviews the progress made in the improve-

ment of corn, wheat, oats, rye, barley, rice, cotton, hay, and forage crops in the United States, and points out the influence which the work of this Department and the experiment stations has had upon the results thus far obtained.

Experience and results in plant breeding, O. Pitsch (*Deut. Landw. Presse, 30 (1903), Nos. 47, p. 415; 48, pp. 429, 430; 49, p. 40*).—Breeding experiments with mangels, sugar beets, and wheat are described. Golden Tankard and Petite Anglaise mangels were planted together with Kleinwanzlebener sugar beets, and natural crosses were obtained. The work of selection carried on for several generations is discussed and brief notes of the results are given.

A comparative study of the anatomical structure of mangels and sugar beets is reported, and the conclusion is drawn that in a measure the sugar content of mangels is higher in proportion as the anatomical structure of the mangel approaches the finer structure of the sugar beet. It was found, however, that the anatomical structure did not serve as a guide in the selection of mother beets. Further investigation, in which the dry matter was taken into consideration, showed that a high percentage of dry matter, a fine anatomical structure, and a high specific gravity are closely related, and that these qualities are usually not found in specimens high in weight. Specimens showing these 3 qualities, together with a relatively high weight, are considered good mother beets.

A new variety of wheat was originated by the author several years ago by crossing Essex and Rouge Inversable, a Bordeaux wheat. This new variety, known as Bordeaux Bastard, has given better yields than Essex and other standard sorts. Later, crosses between Squarehead and Challenge wheats were obtained, and these are here described. The crosses showing the characters of the Squarehead wheat in the spike were more productive and produced a heavier grain than the new varieties in which these characters were absent. It was also observed that individuals of Bordeaux Bastard wheat having the Squarehead type of ear were much more winter resistant than plants with the common type.

Congressional seed and plant distribution circulars, 1902–1903 (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 25, pp. 23–82, pls. 3, figs. 3*).—These circulars prepared by different members of the scientific force of the Bureau of Plant Industry and one by the chief of the Bureau of Soils, originally printed to accompany seeds sent out through the Congressional distribution, consist of descriptions of varieties and directions for their culture and have been collected and published here for the purpose of permanently recording them.

Among the different subjects considered are the plan of distribution and allotments of Congressional seeds and plants in 1902–3, directions for planting bulbs, methods of cultivating and ginning short and long staple upland and Sea Island varieties of cotton, growing pure cotton seed of good quality, and the culture of different types of tobacco. Historical and descriptive notes are given on the Rivers Sea Island cotton and Sea Island cotton No. 224, varieties tested with reference to their resistance to the wilt disease. A description with a history of the variety is also given of the Iron cowpea, a variety "most noteworthy for its resistance to the cowpea wilt disease and root knot."

Variety tests with Swedish barley (*Deut. Landw. Presse, 30 (1903), No. 32, p. 272*).—The results of variety tests with Swedish barley are briefly noted. Hanna barley ripened early and seemed well adapted to light soils in dry locations. Svanhalskorn barley matured as early as Hanna, but appeared to be better adapted to heavy than to light and dry soils. Swedish Chevalier, a late variety, ranked second in yield and last in quality and gave equally good results on light and heavy soils. Princess barley ripened latest and as a rule gave the best yields on the heavier soils. During the wet season of 1902 it also yielded well on light land. This variety ranked third in quality.

Nitrate of soda as a fertilizer for brewing barley (*Deut. Landw. Presse,*

30 (1903), No. 38, p. 332).—Samples of barley grown in cooperative fertilizer experiments were examined with reference to the purity of the grain, the size, shape, uniformity, color, and mealiness of the kernel and the texture of the hulls, resulting in an average number of points of 21.39 for the samples grown without fertilizers, and of 21.67 for samples from plats fertilized with nitrate of soda, Thomas slag, and kainit. These results are considered as indicating that the use of nitrate of soda does not injure the quality of the barley for brewing purposes. Applications of nitrate of soda in connection with phosphoric acid and potash for the purpose of increasing the yield are recommended.

Variety tests with red clover, O. PITSCH (*Deut. Landw. Presse, 30 (1903), Nos. 38, pp. 331, 332; 41, p. 362*).—The results of tests with 3 continental varieties and American red clover conducted for 4 years are given. Maas, a continental variety, ranked first in the yield of dry matter.

The corn crop, C. G. WILLIAMS (*Ohio Sta. Bul. 140, pp. 67–88, figs. 5*).—This bulletin discusses at some length the selection of seed corn and points out the desirable and essential characters of corn used for seed. Directions for selecting the seed corn with a view to increasing the protein content are given, together with descriptions of the ears of 28 varieties grown at the station. The mean temperature and rainfall at the station for the 5 months of the corn-growing season for 15 years are given in a table. The results of field experiments conducted by the late J. F. Hickman are reported.

A comparison of drill and hill planting covering a period of 4 years shows that planting 1 grain every 12 in. in the row gave the best yield. A distance of 18 in. between single grains gave a marked reduction in the yield. Planting 2 grains every 24 in. gave practically the same results as 1 grain every 12 in.

Experiments in deep and shallow cultivation were carried on for 9 years. Deep cultivation consisted in working the soil with a shovel cultivator to a depth of 4 in., and shallow cultivation in stirring the soil with a spring-tooth cultivator to a depth of an inch a d a half. The average results for the 9 seasons show that the shallow-cultivated plats yielded 4 bu. of grain and 213 lbs. of stover more per acre than the plats receiving deep cultivation.

Of 47 varieties under test for a varying number of years, 22 never completely matured. The best maturing varieties were Hess White, Leaming, Leaming Cuppy, Minnesota King, and Murdock 90 Day. The best yielding varieties stood in the following order: Missouri Leaming, Reid Yellow Dent, Henderson Eureka, Farmer Favorite, Darke County Early Mammoth, and Leaming. Pride of the North, King of the Earliest, Early Butler, and Extra Early Huron Dent are pointed out as good early varieties. Leaming and Reid Yellow Dent are suggested as suitable for the section of the State south of the 40th parallel; Leaming and Clarage for the section between the 40th and 41st parallels, and Clarage and White Cap Yellow Dent for the northern part of the State.

Improvement of corn by seed selection, C. P. HARTLEY (*U. S. Dept. Agr. Yearbook, 1902, pp. 539–552, pls. 7*).—This article discusses the possibilities of increase in yield and improvement in quality of corn; points out the importance of stalk, ear, and kernel in selecting seed, and calls attention to other points to be considered in this connection. Directions are given for the selection of seed, the planting and cultivation of a seed patch, and the storing of seed corn.

The results of 6 breeding experiments, showing the necessity of giving attention to the characters of stalk, ear, and kernel in selecting seed are briefly reported. A stalk of Pedrick Golden Beauty corn, producing exceptionally broad leaves was fertilized with pollen from the same plant, and the seed from the resulting ear produced plants exhibiting the same character. The seed from these plants also produced broad-leaved plants. In one experiment 3 short and very leafy stalks of tall-growing white dent corn were cross pollinated one with another. The resulting

seed produced plants resembling the parent stalks. A test of seed ears varying in the percentage of shelled corn showed that each seed ear transmitted its character in this respect to its offspring. Another test of seed ears showed that the longer the seed ear the greater was the average length of the ears produced.

Experiments have also been made to test the extent to which the size of the germ can be transmitted. The results almost without exception showed the germs of the progeny of the large-germed ears to be plainly larger than those of the progeny from the small-germed ears. The individuality of kernels was studied by planting red and white kernels from a spotted ear of white dent. About one-half of the ears produced had kernels like those planted and the rest of the ears were white. In a second test of this kind various kernels of a hybrid ear followed the same rule of transmitting their individual characters.

The commercial grading of corn, C. S. Scofield (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 41, pp. 24, pls. 4*).—This bulletin discusses the methods and purposes of grading corn; points out the value of definite grade standards and grade uniformity, and describes the methods of determining the percentage of moisture, color, damaged grains, and broken grains and dirt in a cargo of corn. The rules recently recommended by the Chief Grain Inspectors' National Association for the grading of corn are given, and the classes and grades of corn are defined.

"In grading commercial corn there are two classes of elements to be considered: First, those which indicate condition—moisture, percentage of moldy, rotten, or otherwise damaged kernels, and percentage of broken grains, dirt, and other foreign material; and second, those which indicate quality—color, plumpness, relative proportion of starchy to hard material, and relative size of germ." Moisture, percentage of colors in mixtures, percentage of damaged grains, and percentage of broken grains and dirt are regarded as the essential elements in determining the grade.

Improvement of cotton by seed selection, H. J. Webber (*U. S. Dept. Agr. Yearbook 1902, pp. 365–386, pls. 3, dgm. 1*).—This article describes the methods of selection which may be used by cotton planters and breeders, and points out some of the important improvements and results that can be produced by such means. Improvements in the yield of fiber and seed, length of staple, strength of fiber, season of maturing, resistance to disease and storms, and adaptation to soil and climate are considered.

Flaxseed production, commerce, and manufacture in the United States, C. M. Daugherty (*U. S. Dept. Agr. Yearbook 1902, pp. 421–438*).—After considering the growth and development of flaxseed production and manufacture in the United States, the author discusses the products from flaxseed and their uses and describes the manufacture of linseed oil. Statistics on the cultivation and production of flaxseed, the internal commerce in the product, and the production of linseed oil are presented.

Preliminary report on the commercial fibers of the Philippines, J. W. Gilmore (*Philippine Bureau Agr., Farmers' Bul. 4, pp. 58, pls. 4*).—Brief general information is given on the fibers exported from the Philippines and those largely used by the natives. The fiber plants discussed include Manila hemp, maguey, pineapple, cotton, ramie, pangdan, burri or talipot palm, nipa, and rattan. A partial list of the fibrous plants of the Philippine Islands is given. The text of the bulletin is in English and Spanish.

Forage conditions and problems in eastern Washington, eastern Oregon, northeastern California, and northwestern Nevada, D. Griffiths (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 38, pp. 52, pls. 9*).—The field work of 1902, which is here reported, was largely supplementary to that of 1901 (E. S. R., 14, p. 136). The investigations of the season were confined to the drainage area of the Columbia River and to the Great Basin. A general account of these regions is given, and the range is described with reference mainly to its condition and its flora. The occur-

rence and value of a large number of range plants is noted, together with the cultivated plants grown as meadow and hay crops. Notes are also given on the reclamation of swamp lands in this section, the needs of the region, poisonous plants, weeds of meadows and pastures, and a number of diseases injurious to forage crops. The cultivation in this region of alfalfa, timothy, redtop, awnless brome grass, wheat, barley, rye, cheat, and roots as forage crops is considered.

The needs of the region, as summarized by the author, are summer pasture for sheep, hay and pasture crops suited to the highland regions of the Blue and Warner mountains, an early maturing perennial grass for the desert basins where water for irrigation can be obtained for only a very short time, a variety of alfalfa requiring less water than the common form, and another one resisting the effect of soluble salts in the soil. The following native grasses are recommended as worthy of cultivation: Wild wheat (*Elymus triticoides*), bunch blue grass (*Poa lævigata*), short-awned brome (*Bromus marginatus*), mountain rye grass (*Elymus glaucus*), bunch wheat grass (*Agropyron spicatum inerme*), and giant rye grass (*Elymus condensatus*). Brief notes on their value are given.

Field experiment with nitrate of soda on forage crops, E. B. VOORHEES (*New Jersey Stas. Bul. 164, pp. 1–13, 28, pls. 3*).—This work is in continuation of experiments with various forms of nitrogen begun in 1898 (E. S. R., 13, p. 742). In 1902 the crops were grown on acre plats. The following table is explanatory of the experiments and the results obtained.

Results of field experiments with nitrate of soda in 1902.

Kind.	Date of application.	Amount of nitrate applied.	Date of cutting.	Yield. Untreated acre.	Yield. Treated acre.	Gain. Total.	Gain. Percentage.	Value at $3 per ton.	Cost of nitrate per acre.	Net gain over cost.
		Lbs.		*Tons.*	*Tons.*	*Tons.*	*Perct.*			
Rye	Apr. 1	150	May 4–16	4.76	6.55	1.79	37.6	$5.37	$3.38	$1.99
Wheat	...do....	150	May 16–26	4.64	7.50	2.86	61.6	8.58	3.38	5.20
Barnyard millet	July 10	160	Aug. 13–22	7.63	13.38	5.75	75.4	17.25	3.60	13.65
Barley	Sept. 12	160	Oct. 13–16	1.20	2.36	1.16	96.6	3.48	3.60	—.12

It is concluded that the use of nitrate of soda as a top dressing for wheat, rye, and millet increases the yield and improves the quality of the crop. An application of 150 lbs. per acre applied broadcast about April 1, is recommended for wheat and rye, and 150 to 200 lbs. per acre for millet and other summer cereals as soon as the crops are well started.

Leguminous forage plants, J. WITHYCOMBE (*Oregon Sta. Bul. 76, pp. 47–68, figs. 4*).—This bulletin gives popular information relative to the growing of leguminous forage plants in Oregon. The different plants considered are red clover, vetch, alfalfa, crimson clover, field pea, sainfoin, soy bean, and cowpea.

It was observed at the station that the roots of some alfalfa plants withstood the presence of water in the soil, while the roots of other plants either stopped growth or rotted off when reaching a certain degree of moisture. This effect is considered as indicating the possibility of developing by selection a type of alfalfa better adapted to the soil and climatic conditions of western Oregon than the type suited to arid soils and grown under irrigation.

Crimson clover sown in the fall of 1901 germinated about September 1 and yielded the next spring 23.67 tons of green forage per acre, while in 1902 the seed germinated about November 1 and the yield of green forage in the spring of 1903 was only 6.67 tons per acre. The field pea and the cowpea are not considered valuable for western Oregon.

Fertilizer experiments with hops (*Deut. Landw. Presse, 30 (1903), No. 29, p. 224*).—The results of 3 years experiments with nitrate of soda are reported. All plats received 720 kg. of Thomas slag and 360 kg. of 40 per cent potash salt per hectare. Nitrate of soda was applied at the rate of 400 and 650 kg. per hectare, either the entire quantity applied in the spring or $\frac{1}{3}$ of it applied in the fall. One plat received barnyard manure instead of nitrate of soda. As compared with the check plat, the increase in yield per hectare on the various plats receiving different fertilizers was as follows: Barnyard manure, 91 kg.; 400 kg. of nitrate of soda applied in the spring, 109 kg.; the same application $\frac{1}{3}$ applied in the fall, 120 kg.; 650 kg. of nitrate of soda applied in the spring, 204 kg.; and the same amount, applying $\frac{1}{3}$ in the fall, 215 kg.

On the check plat where no nitrate of soda was applied, and on the plat receiving barnyard manure, many strobiles ripened early and the lower leaves of the plant turned yellow, which is considered due to the insufficient supply of nitrogen in the soil. Where the largest quantity of nitrate of soda was applied the hops matured latest and were in general of a better quality than where only 400 kg. per hectare were used. The hops from the plats receiving the heaviest application of nitrate were stronger in aroma and the strobiles were of a deeper green in color, as compared with the crop obtained on the other plats. As a rule plants best supplied with nitrogen were most resistant to drought, plant disease, and insect enemies.

In a separate experiment with the same fertilizer applications, but confined in each instance to a single hill, the yields were as follows: Without nitrate of soda, 195 gm. of dried hops; with 400 kg. of the nitrate per hectare, $\frac{1}{3}$ applied in the fall, 256 gm.; and with 650 kg., $\frac{1}{3}$ applied in the fall, 317 gm.

Time of harvesting horse beans, A. GRÉGOIRE (*Bul. Agr.* [*Brussels*], *19 (1903), No. 4, pp. 525–531*).—A study was made of the composition of the horse bean at different stages of growth and the results of the analyses made on different dates are shown. It was found that the formation of organic substance in the horse bean continues very actively up to the close of the vegetative period. During the last 2 months of growth the plant accumulates only nitrogenous substance and carbohydrate material, with the exception of fat and cellulose. The composition of these substances at the close of the vegetative period was found to be the same as during the early growth. The percentage of nutritive matter and its digestibility increased continually during the growing season. With these results in view the author recommends late harvesting.

Ten years' experiments with oats, C. G. WILLIAMS (*Ohio Sta. Bul. 138, pp. 39–52*).—Previous results in this series of experiments have been noted (E. S. R., 11, p. 234). The results for the different seasons are here shown in tables and discussed. American Banner, Improved American, Colonel, and Clydesdale, all varieties of the Welcome type, gave the largest average yield per acre and heaviest weight per measured bushel. Plowing sandy clay soil as compared with merely disking it proved profitable. The use of 9 to 10 pecks of seed per acre gave better results than the use of a smaller quantity. Using only the heaviest seed was found very advantageous, and sowing not over 1 inch deep gave better returns than deeper seeding. Broadcasting gave heavier yields than drilling 2 or 3 inches deep. The author does not conclude that broadcasting is better than drilling, but believes that oats are commonly drilled too deep.

Tests of yellow and green grained strains of different varieties of rye, A. GEERKENS (*Fühlings Landw. Ztg., 52 (1903) Nos. 8, pp. 269–274; 9, pp. 311–315*).—The experiments here reported were at once variety tests and breeding experiments. Petkuser rye proved to be the hardiest variety under test, and its superiority in this respect was especially shown on light soils. On heavy soils Russian Staudenroggen was fully equal to Petkuser in resisting winter weather. Göttingen rye showed the lowest degree of hardiness. The best yields were obtained from strains origi-

nated by the selection of greenish grains as compared with strains derived from yellowish kernels. The greater productiveness of the progeny of the green kernels, was most apparent where the plant food supply of the soil was smallest.

Observations were also made to determine the relation between the color of the grain and the form of the head. Former experiments have indicated that apparently there is a relation between green grains and short and compact heads, and yellow grains and long loose heads. The author does not consider this relation a very close one, because it is observed only in classifications based on the compactness and length of the spike and never becomes apparent where the classification is made according to the color of the grain. This feature is not regarded as hereditary. The strains with the least compact heads were the most productive. The author concludes that breeding for green grain and, within certain limits, for loose heads may be done simultaneously without connecting these two characters.

The cultivation of sisal in Hawaii, F. E. CONTER (*Hawaii Sta. Bul. 4, pp. 31, figs. 9*).—This bulletin after briefly noting the history of the sisal industry and describing the 2 varieties, *Agave rigida elongata* and *Agave rigida sisalana*, contains an account of the culture of sisal and its preparation for market, with notes on the diseases and insect enemies of the plant and the prospect of the sisal industry in Hawaii.

Culture and composition of the soy bean, G. LECHARTIER (*Ann. Sci. Agron., 2 ser., 1 (1903), No. 3, pp. 380–396*).—The results of culture and fertilizer experiments in progress for several years are reported, and analytical data for the green crop and the ripe seed are given in tables. It is estimated that the soy bean is capable of producing under the climatic conditions of Brittany a yield of 20,000 to 30,000 kg. of green forage per hectare. When sown in April the crop can be utilized in September. The pods were found to constitute about one-third of the entire crop by weight. The analyses presented show that the pods contain more nitrogenous matter and more fat than the stalks and leaves. The seed is especially rich in these substances and is considered superior in this respect to that of other leguminous crops.

The yields of seed in the experiments varied from 1,500 to 1,800 kg. per hectare. The seed did not mature completely in Brittany in cool and moist seasons, and for this reason the culture of this crop for the seed is considered better adapted to the warmer and drier provinces of France. It is concluded from the result that the yield of 2,000 to 3,000 kg. of green crop withdraws from the soil 32 to 48 kg. of phosphoric acid, 125 to 188 kg. of lime, 41 to 62 kg. of magnesia, and 71 to 106 kg. of potash per hectare. These figures for phosphoric acid and potash correspond to 200 to 300 kg. of superphosphate and a maximum quantity of 200 kg. of chlorid of potash. The crop contains from 100 to 150 kg. of nitrogen per hectare. From 100 to 200 kg. of nitrate of soda per hectare is thought to be the proper quantity of nitrogenous fertilizer for the crop.

Sugarhouse refuse as a fertilizer for sugar beets, F. STROHMER (*Mitt. Chem. Tech. Vers. Stat. Centralver. Rübenz. Ind. Oesterr.-Ungar., 1903, No. 149, pp. 1–31*).—Results obtained in 1902 are reported, but in summarizing the work the results of the previous year are also taken into consideration. In no case did the use of sugarhouse refuse prove injurious to the quality of the beets. The substance did not show any special advantage, but is regarded of value simply for the nitrogen and potash it contains. The nitrogen of the refuse acts like the nitrogen given in the form of nitrate of soda, and the potash similar to the potash given in the form of the sulphate.

Beets for distillery and forage purposes, L. MALPEAUX (*La betterave de distillerie et la betterave fourragère. Paris: Masson & Co., pp. 194, figs. 15*).—A popular treatise on the history and culture of beets for distillery and forage purposes. Chapters are also given on the feeding of beets and the manufacture of alcohol.

The California sugar industry, G. W. SHAW (*California Sta. Bul.* [illegible], *pp.* [illegible],

figs. 15).—This bulletin contains a historical review of the beet-sugar industry in California. The present magnitude of the industry is shown by a comparison of the value of the sugar produced with the values of other products of the State, and by a list of factories in operation, the location, capacity, and invested capital of which is given. The history of the industry is considered in 3 periods—the early period from 1857 to 1880, the dormant period from 1880 to 1887, and the modern period from 1888 to 1902. The different factories are described and statistics for each one are presented.

Sugar-cane culture in the Southeast for the manufacture of table sirup, H. W. Wiley (*U. S. Dept. Agr., Bureau of Chemistry Bul. 75, pp. 40*).—This bulletin presents the results of experiments with fertilizers for sugar cane conducted in Georgia, together with the reports of special agents on the culture of the crop in Georgia, Alabama, Mississippi, and Florida. The work is carried on under the supervision of the Bureau of Chemistry of this Department.

Fertilizer experiments on sugar cane, W. B. Roddenbery (pp. 5–24).—The experiments were conducted on 2 fields, designated as A and B. Field A, in cultivation about 20 years, is in a low state of fertility. Field B, in cultivation only 5 or 6 years, and in a much higher state of fertility, produced a very rank crop of velvet beans, which was plowed under the fall before the experiments were begun. On several series of plats different methods of applying a normal fertilizer formula were tested. Experiments with varying proportions of plant foods were carried on, and cotton-seed meal and nitrate of soda, cotton seed and cotton-seed meal, and kainit and muriate of potash, as fertilizers for sugar cane, were compared. The normal formula was as follows: 16 per cent acid phosphate, 1,200 lbs.; 8 per cent cotton-seed meal, 400 lbs.; 19 per cent nitrate of soda, 200 lbs., and 50 per cent muriate of potash, 200 lbs. An application of 1,200 lbs. per acre of this formula was used. The composition and cost of the fertilizer is reported.

The results show that velvet beans have a high fertilizing value, but that the maximum is reached only when phosphoric acid and potash are applied in the fertilizer. Applying a part of the fertilizer at the time of planting and the rest at intervals during the growing season gave the best returns. The use of different applications of the normal formula on the 2 fields indicated that on land in a good state of fertility, such as field B, an application of 800 or 1,000 lbs. per acre is the most profitable, while on poorer soil, as in field A, from 1.200 to 1.500 lbs. may be used to advantage.

Fertilizers furnishing large quantities of phosphoric acid and potash were more effective than those furnishing small quantities of these ingredients. Muriate of potash gave somewhat better results than kainit. Doubling the quantity of phosphoric acid given in the normal formula on field A gave a decrease of 1.5 tons of cane per acre and a gain of only 3.5 tons over the plat which received no phosphoric acid. For this soil 100 lbs. per acre of phosphoric acid is considered sufficient. Doubling the normal ration of this same element on field B gave a gain of 3 tons per acre and a gain of over 13 tons over the plat receiving no phosphoric acid. An application of about 200 lbs. of phosphoric acid per acre is believed to be the most profitable proportion for this soil. Applying double the quantity of potash was of no advantage on either field, and it is concluded that 50 lbs. per acre of actual potash is sufficient for both fields.

Nitrate of soda proved a better source of nitrogen than either cotton-seed meal or cotton seed on the poorer soil, while on the more fertile field nitrate of soda and cotton-seed meal gave the same tonnage. Cotton seed was found to be the most expensive fertilizer of the 3 substances. Cotton-seed meal gave $14 per acre more profit than the same value in cotton seed, and nitrate of soda $12 more than the same value in cotton-seed meal. A high percentage of nitrogen in the fertilizer was found to assist germination and favor suckering, while applying quantities of complete fer-

tilizers in the furrow with the seed cane prevented germination. Doubling the nitrogen of the normal formula on field A gave a gain of 3 to 3.5 tons and an increase in profit of about $9 per acre, while on field B doubling the nitrogen reduced the yield. For field A 65 lbs. of nitrogen per acre given in the form of nitrate of soda, and for field B 20 lbs. are recommended.

The following application per acre is recommended for field A: 12.5 per cent acid phosphate, 800 lbs.; cotton-seed meal, 100 lbs.; nitrate of soda, 300 lbs.; and muriate of potash, 100 lbs. The application recommended for field B is as follows: 12.5 per cent acid phosphate, 1,600 lbs.; nitrate of soda, 100 lbs.; and muriate of potash, 100 lbs.

Reports of special agents on the sugar industry, G. L. Spencer et al. (pp. 25–40).—A review of the sirup industry of the United States is given, and the methods of cane growing for sirup making in the different States and localities are described. The composition of the cane juices sampled at factories in the various sections is reported. The averages of the analyses at the different places are given in the following table:

Summary of analytical data on cane juices.

Town and State.	Composition of juice.			Number of samples.
	Sucrose.	Reducing sugar.	Purity.	
	Per cent.	*Per cent.*		
Cairo, Ga	11.42	1.68	77.49	27
Guyton, Ga	10.50	2.24	70.69	32
Waycross, Ga	12.83	1.64	75.82	16
Quitman, Ga	11.95	1.60	77.97	32
Geneva, Ala	12.26	1.73	77.43	16
Magnolia, Miss	12.75	1.46	76.41	28
Huntington, Fla	12.52	1.40	76.11	2
Average	12.03	1.82	75.99	

From the data presented it is concluded that for the manufacture of sugar the canes would not be profitable, but that for sirup making they are of excellent quality. "The high quantity of reducing sugar, which interferes with sugar manufacture, is no bar to sirup manufacture; on the contrary it is an advantage, as the reducing sugar is quite as sweet and palatable as sucrose and has a much lower coefficient of crystallization. Hence, its presence in the product, while impairing neither its appearance nor its taste, improves the selling qualities of the sirup by diminishing the tendency to crystallization."

A primer on the cultivation of sugar cane, W. S. Lyon (*Philippine Bureau Agr., Farmers' Bul. 1, pp. 40*).—This bulletin is an English and Spanish edition of a popular paper on sugar-cane culture in the Philippine Islands.

Cultivation of tobacco, C. W. Dorsey (*Philippine Bureau Agr., Farmers' Bul. 5, pp. 20, figs. 4*).—The methods employed in modern cultivation of tobacco are briefly outlined; the growing of tobacco under shade in the United States is described, and the conditions of tobacco culture in Sumatra, with special reference to the industry in the Philippines, are discussed.

Universal nomenclature of wheat, N. A. Cobb (*Agr. Gaz. New South Wales, 12 (1901), No. 12, pp. 1614–1629, pl. 1; 13 (1902), Nos. 1, pp. 74–90, pls. 3, figs. 10; 2, pp. 214–243, pl. 1; 4, pp. 415–418; 8, p. 850, pls. 3; 14 (1903), No. 6, pp. 546–549, pls. 4*).—This series of articles discusses the value of a universal nomenclature of wheat and a uniform system of describing varieties. A sample description is given of Blount-Lambrigg wheat. In addition to this discussion the results of examining a list of wheats as to the structure of the aleurone layer are given. The biological analysis of the kernel, the flour cells, and other cell layers of the wheat grain, and methods of staining and of preparing sections for the microscope are described. The series

of varieties studied in this connection are classified as to the color of the straw, their late or early maturity, and their high or low nitrogen content.

Saragolla wheat, D. G. Fairchild (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 25, pp. 9–12*).—This article calls attention to the value of Saragolla wheat for the manufacture of macaroni. The variety is grown in southern Italy, and is regarded as the best for the production of a fine-flavored product. A description is given of the process of making macaroni employed by the steam factories in one of the most important macaroni-manufacturing districts in southern Italy.

A study of the wheats of the Province of Santa Fé, C. D. Girola (*Estudio sobre los trigos de la Provincia de Santa Fé. Buenos Aires: Min. Agr., 1902, pp. 47, maps 2*).—A general discussion of wheat culture in the province, with cultural directions and statistical data. A number of varieties are described in detail, as are also the impurities which occur in wheat seed.

Experiments with wheats of the Province of Cordova, C. D. Girola (*Estudio sobre trigos de la Provincia de Córdoba. Buenos Aires: Min. Agr.* [*1902*], *pp. 14*).—The results of physical analyses of 40 samples of wheat comprising 6 varieties are reported and discussed.

Seed wheat, N. A. Cobb (*Sydney: Govt. Printer, 1903, pp. 60, figs. 36; reprint from Agr. Gaz. New South Wales, 14* (*1903*), *Nos. 1, pp. 33–50; 2, pp 145–169; 3, pp. 193–205, figs. 36*).—The method of grading seed wheat to show the proportion of 7 different sizes of kernels in a sample is described, and the results of grading a large number of varieties of wheat according to this method are presented in a table.

Trials with large plump and small shrivelled grains for seed are reported. Large, plump seed proved to be best in germination, plant-producing power, yielding capacity, and the production of grain of a high quality. The author discusses the advantages of grading seed wheat and describes a number of machines used for this purpose.

Influence of the awns on the transpiration of the spike and the quality of the grain, L. Perlitius (*Mitt. Landw. Inst. Univ. Breslau, 2* (*1903*), *No. 2, pp. 305–381, pls. 3; abs. in Deut. Landw. Presse, 30* (*1903*), *No. 50, pp. 450, 451*).—Observations made to determine the activity of the awns of wheat and barley showed that a considerable portion of the water transpired by the spike passes through these organs and that the quantity increases with their length. Awned wheat spikes in some cases transpired double the quantity of water transpired by awnless heads or heads from which the awns had been removed. In the case of barley it was fourfold instead of being double the quantity. Transpiration was most active during the development of the spike and the grains. The period of maximum activity varied with the different types of spikes, and it always occurred during the development of the grains before these had reached the milk stage. The length of the awns and the vegetative period of the spikes were inversely proportional to each other.

It is further concluded that the awns have a decided influence upon the volume and weight of the kernels, and that their action in this direction takes place shortly before the kernels are in the milk. The results of chemical analyses indicate that the grain of awn varieties is lower in nitrogen and higher in starch than that of awnless sorts. The absolute amount of ash in the grain is believed to be increased by the activity of the awns, and for this reason awn varieties are capable of using mineral fertilizers to best advantage. The final conclusion from these experiments is that awn cereal varieties under normal weather conditions ripen earlier than the other varieties.

The anatomical structure of the glumes and awns of wheat and barley was studied and is here compared in a series of illustrations. A list of 55 references bearing on the different phases of the work reported is given.

Investigations on the stooling of grains, W. Rimpau (*Landw. Jahrb., 32* (*1903*), *No. 2, pp. 317–336; abs. in Deut. Landw. Presse, 30* (*1903*), *Nos. 44, pp. 392,*

393; 45, p. 398).—The results of investigations on the influence of the stooling capacity on the productiveness of different varieties of wheat, oats, barley, and rye are reported and compared with the results obtained by Schribaux in similar work. The plants under observation were grown in rows 6 m. long and 25 cm. apart. Single kernels were planted 5 cm. apart in the row. The different varieties entering into the experiments are described. The data for each plant, comprising the length of stem and head, the total weight, the number and total weight of the kernels produced, and the average weight per single grain are shown in tables. The author states that the results do not indicate, as Schribaux asserted, that the most productive varieties of grain have the lowest stooling capacity. This was found to be the case in a number of instances, but is not regarded as occurring with sufficient regularity to be considered the rule.

The different stems of the plant were studied in order to determine whether any relation existed between the order of their appearance and their productivity. The data show that the stems thrown up in the stooling process were frequently as productive, and sometimes more so, than the initial stems, and this is regarded by the author as showing that the initial stem can not be considered as being regularly the best.

A comparison of the first 3 stems with the 3 following ones, with reference to the same point, did not show a regular advantage in favor of the earlier appearing stems. It is shown that under normal conditions more than 3 stems per plant are seldom produced. For breeding purposes the selection of well-stooled plants, but only those with uniform stems and heads, is recommended.

Stack ensilage, A. CONLON (*Council Agr., Tasmania, Bul. 7, pp. 8, figs. 5*).—Directions are given for the preparation of stack ensilage, and the temperatures recorded in the stack are shown on a chart.

HORTICULTURE.

Cassell's dictionary of practical gardening, W. P. WRIGHT (*London, Paris, New York, and Melbourne: Cassell & Co., Ltd., 1902, vols. 1, pp. VII + 480, pls. 10, figs. 335; 2, pp. 480, pls. 10, figs. 219*).—This is a well-illustrated encyclopedia of practical horticulture, dealing with the propagation and culture of fruits, vegetables, foliage, and flowering plants and shrubs, out of doors and under glass. The articles on each subject are concisely written. Such matters as the derivation of plant names, habitats of different plants, history of introduction, and botanical details are omitted. Attention is centered on propagation, soil, and general culture, with a list of the best species or varieties. Notes are usually given also on the height, flowering period, degree of hardiness, and color of the flowers of different plants. Various horticultural practices are described and explanatory entries made under the different terms used in horticulture. The materials used in gardening operations are also described.

New experiments in electro-culture, P. VAN BIERVLIET (*Rev. Gén. Agron. [Louvain], 12 (1903), No. 5, pp. 193–200*).—The author conducted some electro-culture experiments with barley, oats, potatoes, strawberries, and carrots, using the electrical machine devised by S. Lemström (E. S. R., 14, p. 352). The season for the experiment was very unfavorable. Nevertheless, the results on the whole show considerable increase on the plats subject to electro-culture. This increase was about 50 per cent for strawberries, 13.8 per cent for potatoes, 13 per cent for carrots, 10.5 per cent for barley grain, and 21.65 per cent for barley straw. Notwithstanding the unfavorableness of the season, and the necessity for interpreting the results obtained with caution, the author still believes that the application of electricity as proposed by Lemström has a decided influence on crop growth.

Is it more advantageous to use seeds the year they are harvested, or after several years preservation? GROSDEMANGE (*Rev. Hort. [Paris], 75 (1903), No. 13,*

pp. 304, 305).—This is an abstract of a paper read by the author at the Paris Horticultural Congress, May 22, 1903. It presents results of a preliminary study on the germination of seeds. The author states that in the majority of cases fresh seeds give the best results, but with the following exceptions: With carrots, 2-year-old seed gives less leafy plants and more highly colored roots. The use of 3 or 4 year old chicory seed tends to prevent premature greening. With cabbage, the use of 2 or 3 year old seed tends to produce better heads than fresh seed. With gherkins, pumpkins, and melons, seed 2 or 3 years old is preferred; fresh seed produces too leafy vegetation. Likewise corn salad seed 2 or 3 years old is preferred to fresh seed. With radishes, fresh seed is preferred for outdoor soil, since it produces more robust plants, but seed 2 or 3 years old is preferred under glass because it produces a less leafy product.

Commenting on these results, M. Bazin stated that fresh seeds should always be preferred when it is wished to produce plants with a strong leaf growth, while for plants which it is desired should head well, like cabbage, salads, melons, cucumbers, etc., it is preferable to use seeds 2 to 3 years old. With ornamental plants, particularly with balsams, seed more than a year old tends to produce double flowers to a much greater extent than fresh seed.

Three new plant introductions from Japan, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 42, pp. 24, pls. 6*).—The 3 new plant introductions discussed in this bulletin are Mitsumata, a Japanese paper plant; Udo, a new winter salad; and Wasabi, a kind of horse-radish. These various plants are described and their culture, as observed in Japan and the places in the United States where each is likely to succeed, are noted. From Mitsumata (*Edgeworthia papyrifera*) a superior kind of paper is made. The plant grows about 5 ft. high, and the paper is made from the bark. Udo (*Aralia cordata*) is grown in a manner somewhat similar to asparagus. The edible portions of the plant are the young shoots which are blanched by being covered with earth, and are available for use the second year from seed and for a series of years thereafter. It is not expected that this salad plant will compete with lettuce, but it is believed that it will make a very desirable winter change. Wasabi (*Eutrema wasabi*) is propagated from suckers and grown 2 years in the field before being marketed. It is considered a very appetizing relish.

Plant introduction notes from South Africa, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 25, pp. 13–22*).—These notes consist of brief accounts of 3 Cape seedling grape varieties—the Red Hanepoot grape, *Vitis rupestris metallica*, and the Le Roux grape; two fruit-bearing hedge plants—*Carissa grandiflora* and *C. arduina*, commonly called amatungulas; Rhodes grass (*Chloris virgata*), the Kafir plum, and the Natal pineapple. Attention is called in connection with these notes to the rooi-bloem, a new corn parasite which is causing damage in the South African corn fields.

Experiments in mulching, R. A. EMERSON (*Nebraska Sta. Bul. 80, pp. 26*).—Comparative records are given of the yield and behavior of lettuce, cabbage, tomatoes, peas, beans, cucumbers, watermelons, muskmelons, sweet corn, beets, salsify, carrots, parsnips, onions, potatoes, and sweet potatoes when grown on plats kept cultivated throughout the season and on plats mulched with straw. The work has been under way for the 3 seasons 1900–1902. Irrigation was practiced on a portion of each plat in the dry year of 1901. In 1902 the comparison was made on both bottom land and upland. The mulch used for the most part was old straw applied about 4 in. deep after settling. Generally it was put on about a month after the seed was sown and after the plants had received 2 or 3 cultivations. A special test is reported of different kinds and depths of mulches for potatoes.

Mulching proved of doubtful value with lettuce. It was difficult to apply the mulch without injury to the tender plants, thus decreasing the stand, and in only 1 year out of the 3 was the size of the head larger on the mulched than on the cultivated area.

Cabbage appeared to be benefited by mulching. Two years out of 3 the size of the heads was noticeably larger and rotted less on the mulched plats. The mulched cabbage, however, suffered more from the attacks of grasshoppers. It is stated that the plants are more easily mulched 2 to 4 weeks after planting than when smaller.

With tomatoes the mulched plants were smaller but the fruit yield larger than with cultivated plants. Less rot and more perfect specimens also characterized the fruit of the mulched plats. In general mulching proved advantageous with tomatoes, but care should be taken not to apply the mulch before the young plants are well established. Mulched tomatoes are also injured more by early fall frosts than when cultivated.

Mulched peas were somewhat later than cultivated peas, but further work is required with this crop before any definite conclusions can be drawn.

Navy and Golden Wax beans were decidedly benefited by mulching. The Lima beans showed but little difference as regards the 2 methods of culture. It is believed that in normal seasons mulching increases the yield of beans over cultivation except in cases of late planting or naturally late varieties, when, by delaying maturity, the beans are more likely to be injured by early fall frosts.

A larger yield of better developed cucumbers was secured on the mulched than on the cultivated plats. The mulched plants were somewhat later than the others and were less affected by plant lice. The results with muskmelons and watermelons were not conclusive. The tests showed, however, that if mulching is to be practiced with these crops, the mulch must not be applied until the plants are thoroughly well established. Mulching proved very undesirable with sweet corn during the wet season, and it is thought doubtful if it will ever prove of practical use for this easily cultivated crop. The yields obtained with beets were not decidedly in favor of either method of culture. It is thought probable, however, that less labor is required to mulch beets than to cultivate them. Salsify, like beets, showed no marked differences in favor of either method of culture. On low ground, during a wet season, arrots proved to be benefited by mulching, while the reverse was true with parsnips. The quality of the parsnips was also poorer on the mulched ground.

Early mulching of onions proved decidedly injurious. Transplanted onions on mulched plats gave slightly increased yields in some instances and decreased yields in others. The labor involved in mulching is probably less than in cultivation. Mulching proved undesirable with drilled onions owing to the difficulty of spreading the straw without injuring the stand of plants.

With potatoes, mulching on the whole has proved very satisfactory. The yield has been increased by mulching and the quality injured only in very wet seasons. In a special test of a 4-in. and 8-in. straw mulch and early and late mulching, a 4-in. mulch applied late in the summer, after several cultivations, has given the best results.

The best results with sweet potatoes were secured on mulched plats ridged and irrigated, the increased yield being about 19 per cent greater than on cultivated plats. The vines, however, were injured to a greater extent by early fall frosts than those on cultivated plats. The vines did not take root through the straw mulch as they do on cultivated ground, which is considered a decided advantage for mulching.

The moisture content of the mulched and cultivated plats of cabbage, peas, beans, cucumbers, watermelons, sweet corn, and beets was determined during the season of 1900 and found to average 18.2 per cent in the mulched plats and 17.1 per cent in the cultivated plats.

Briefly summarized, the results of these experiments show that with lettuce, drilled onions, and sweet corn, mulching is undesirable. With beets, salsify, carrots, parsnips, transplanted onions, peas, and melons, the labor requirements and yields are about the same by either method. Very favorable results have been secured by mulching cabbage, tomatoes, beans, cucumbers, potatoes, and sweet potatoes.

"Whether mulching shall be used in a particular case depends upon the vegetables to be grown. Early spring vegetables requiring only a few cultivations can usually be grown more cheaply by cultivation than by mulching. Furthermore, very early mulching, before the ground has become thoroughly warm, is apt to retard the development of the vegetables. On the other hand, summer or fall vegetables that require frequent cultivation throughout the season are grown as a rule with less labor by mulching than by cultivation."

If vegetables can be mulched in the summer after they have been given a few cultivations, it is believed much better results will be secured than by the now common method of entire neglect when the rush of summer work comes on.

Field experiments with nitrate of soda on market garden crops, E. B. VOORHEES (*New Jersey Stas. Bul. 164, pp. 14–28, pl. 1*).—An account of further work in the use of extra amounts of nitrate of soda for carrots, cabbage, celery, and cucumbers grown on ground already heavily fertilized (E. S. R., 14, 247). The experiments were also planned to study the value of different amounts and fractional methods of application.

Further work with carrots seems to confirm the results reported in 1901 to the effect that extra applications of nitrate of soda have a depressing effect on this crop, the yields being considerably less where additional amounts of nitrate of soda were used than where it was omitted.

Cabbage has again been greatly benefited by the use of extra amounts of nitrate of soda. The quantity has been greatly increased and the quality improved. The average increased yield on all the plats receiving additional quantities of nitrate of soda has been about 150 per cent more than where no additional amount was used. Whether the nitrate should be given in 2 or 3 applications was not brought out very clearly. When 300 lbs. of nitrate of soda per acre was used the best results were secured when it was distributed in 3 applications. But when 400 lbs. was applied, 2 applications resulted most advantageously. Larger profits resulted from the application of 400 lbs. per acre than from 300 lbs. In this experiment it is shown that the use of each 100 lbs. of nitrate of soda resulted in an increased yield of from $17 to $21.76. Since the price of nitrate of soda seldom exceeds $2.25 per 100 lbs., the profitableness of its use is plainly seen.

The most striking example of the value of additional amounts of nitrate of soda has been obtained with celery. The increased yields with its use have varied from 6,600 to 18,900 lbs. per acre, and the quality and selling price of the celery have been improved. Each dollar invested in nitrate of soda for this crop has given a return of from $25.47 to $39.05. There was a lack of uniformity in regard to the amounts of nitrate of soda used and the methods of application. When 300 lbs. was used per acre the best results were secured when it was applied in 3 equal applications, but when 400 lbs. was used the best results were secured from 2 applications. The experiment is believed to show that where the land is reasonably fertile and has received the ordinary dressing of manure and fertilizer, the use of nitrate of soda at the rate of 300 lbs. per acre in 3 equal applications is sufficient.

Cucumbers were grown in 1902 for making mustard pickles, and the crop was allowed to ripen before any were picked. The field was first fertilized with complete fertilizers, and then a test made of the value of additional amounts of nitrate of soda. The increased yield of all the plats, due to the use of nitrate of soda, was 86.5 per cent. The best results were secured when 300 lbs. of nitrate of soda was used per acre in 3 applications, the increased yield in this instance over the control plat being 126 per cent.

The final conclusions for the year's work are the same as those of 1901 (E. S. R., 14, p. 248), to the effect that after a crop has been fertilized with a complete fertilizer according to the usual custom, an additional amount of nitrate of soda may

still be used at a profit with nearly all vegetable crops: the yield is increased and the quality improved by the use of 300 to 400 lbs. per acre.

Fertilizers for special crops, A. F. WOODS and R. E. B. McKENNEY (*U. S. Dept. Agr. Yearbook, 1902, pp. 553–572*).—A popular article dealing with the use of fertilizers for roses, violets, carnations, chrysanthemums, tomatoes, and lettuce.

Suitable fertilizers in the cultivation of lettuce, BEAUCAIRE (*Sci. Amer. Sup., 55 (1903), No. 1428, p. 22883; trans. from Le Phosphate*).—An account of the culture of lettuce in washed sterilized sands with (1) no fertilizers, (2) farm manure, (3) complete fertilizer, (4) special complete fertilizer, (5) nitrogen and phosphate, (6) nitrogen and potash, and (7) potassium phosphate. The lettuce in the pot without fertilizer had sickly yellow leaves and produced no branches, notwithstanding the fact that it was sprinkled with a solution of ferric sulphate. The pots with farm manure and the complete fertilizers produced perfect crops of lettuce. Plants in pot 5, without potash, made a poor development of stalk, while in pot 6, without phosphoric acid, even a less development was made.

In commenting upon these results it is stated that lettuce, in order to produce seeds in quantity, requires a soil rich in nitrogen, and that phosphoric acid is more useful than potash. Ferric sulphate is also believed to prevent the plants from yellowing and to facilitate fructification. A 5 per cent solution is recommended when the flowers begin to appear.

Garden vegetables, H. H. CHAPMAN (*Minnesota Sta. Bul. 81, pp. 244–247*).—In a review of the work of the Northeast Experiment Farm since its organization in May, 1896, an account is given of the growth of certain vegetables, fruits, and shrubs. The 2 varieties of watermelons that have ripened at the station are Hungarian Honey and Fordhook. It has been found necessary to start tomatoes in the greenhouse in order to ripen them before frost. Sweet corn has always matured sufficiently for table use, even the later varieties. Strawberries ripen from July 4 to 20. It is recommended that new beds be set out in the spring in 4-ft. rows and 18 in. apart in the row. Matted rows give the best results. In the fall after the ground is frozen they should be covered 2 to 3 in. deep with straw. The most satisfactory varieties are Brandywine, Clyde, Splendid, Lovett, and Bederwood.

Raspberries and blackberries can be successfully grown when trained to hills and bent over and covered with dirt or straw in the fall for winter protection. Only the hardiest varieties of apples like Hibernal, Patten Greening, and Duchess can be successfully grown in the extreme northern counties of the State. Poor success has followed the setting out of trees on sandy soil. A clay subsoil at not too great a depth is advocated with a northeast slope, but a level or southern slope with suitable soil is better than a northern slope with sandy soil. Nearly all varieties of American native plums are hardy. Cheney is the best variety tested. Aitkin is recommended for planting at the same time for pollinating Cheney.

Vegetable and bush fruits, L. R. TAFT and M. L. DEAN (*Michigan Sta. Bul. 209, pp. 103–122*).—Notes are given on the better varieties of pole beans, bush beans, cabbages, lettuce, garden peas, sweet corn, potatoes, tomatoes, raspberries, blackberries, currants, and gooseberries grown at the station during 1902. This work is a continuation of that carried on for a number of years at the station (E. S. R. vol. 14, pp. 143).

New onion culture, T. GREINER (*New York: Orange Judd Co., 1903, rev. and enl. ed., pp. 112, figs. 52*).—This work has been rewritten and considerably enlarged. The bibliography given contains a very full list of references to experimental work in onion culture done by the agricultural experiment stations.

A new preserving melon, the "Triamble" (*Agr. Gaz. New South Wales, 14 (1903), No. 7, p. 587*).—A description is given of a new preserving melon supposed to be a hybrid between the Rio pumpkin and the common preserving melon. It is stated to be a very heavy cropper, exceedingly hardy, and able to stand dry weather

well. Specimens weighing 56¼ lbs. are recorded, though the average size appears to be less than 20 lbs.

Germination of truffle spores; culture and character of truffle mycelium, L. Matruchot (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 18, pp. 1099–1101*).—The author succeeded in growing pure cultures of the spores of the Perigord truffle (*Tuber melanosporum*) and of the Burgundy truffle (*T. uncinatum*) on cut potato tubers to which a nutritive liquid was added and the whole rendered as aseptic as possible. The spawn developed within a few weeks in practically unlimited quantities and was clearly proven to be identical with wild spawn.

Artificial culture of the truffle, R. Dubois (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 21, pp. 1291, 1292*).—The author succeeded in growing truffle spores by placing them in contact with living vegetable tissue. A thin piece of truffle, the upper part of which contained the asci, was introduced into a tuber or root able to resist dessication for a long period. A notch or gash was first made in the tuber as aseptically as possible, and the piece of truffle fitted tightly into this. The whole was then kept in a moist dark place. Within a few weeks spawn developed at the point of contact. The spawn was gathered and sown in vessels containing a gelatinous mass, composed of cooked starch, glucose, glycerin, asparagin, and a little tannin. The spawn developed rapidly, appearing in large white spots, but at the end of the year had not produced fruiting organs. The spawn was then seeded at the foot of truffle oaks. The results have not yet been ascertained.

Fungus cultures (*Gard. Chron., 3. ser., 33 (1903), No. 861, pp. 414, 415*).—This is a brief review of the work of L. Matruchot and R. Dubois, noted above, who were successful in cultivating truffle spores. In addition the work of E. Boulanger, who succeeded in growing truffle spores as early as 1898, is noted. It is claimed that Boulanger succeeded in germinating the ascospores of the truffle in a sterilized watery liquid. "The spawn developed well on slices of carrot, on the same material buried in calcareous earth, in calcareous earth only, on mold, and under the ordinary conditions in which cultures are made, but carbonate or bisulphate of lime facilitated development.

"The ascospores of *Tuber uncinatum* yielded a well-developed spawn, and this gave rise to a 'perithecium,' that is, to the truffle itself; tasteless, scentless, and deformed doubtless, but nevertheless an adult perithecium, inasmuch as it contained normal asci. The spawn also developed a conidial form, wherein the spores were united together in numerous clusters and connected by mucilage."

American horticultural manual. II, Systematic pomology, J. L. Budd and N. E. Hansen (*New York: John Wiley & Sons, 1903, pp. 491, pls. 9, figs. 386*).—This volume supplements Part 1 (E. S. R., 13, p. 1044), and contains an outline of the numerous systems of classification which at one time or another have been used for classifying apples. Descriptions are given of all those varieties of fruits so far as known which are recommended at the present time by horticultural societies and growers. Nearly one-half of the book is devoted to the apple and the remainder to the usual orchard and small fruits grown in the United States, including grapes, cranberries, and nuts, and such subtropical fruits as the banana, date, fig, guava, custard apple, loquat, olive, citrus fruits, pineapple, etc.

Topworking orchard trees, G. H. Powell (*U. S. Dept. Agr. Yearbook 1902, pp. 245–258, pls. 4, figs. 8*).—A discussion of the purposes, methods, and advantages of topworking fruit trees with detailed directions for doing the work. Topworking is resorted to for the purpose of changing the variety, lessening the injury from sun scald and insects, modifying the vigor of the tree, hastening fruitfulness, and perpetuating desirable characteristics. Trees may be topworked either by budding or grafting. Budding is believed to be usually more satisfactory than grafting. "The operation is more simple, the wound heals more quickly, and the form of the tree can be regulated to better advantage by inserting the buds on the body, but the most

satisfactory results follow the adoption of both branch and body budding on the same tree when one is needed to supplement the other."

It is not believed profitable to topwork trees over 25 or 30 years old. Only a part of the tops of trees this old should be removed in any one year. The article, while applicable to all orchard fruits, deals more particularly with apples and peaches.

Suggestions concerning apple culture, W. J. Green (*Ohio Sta. Bul. 137, pp. 25–38*).—Popular directions are given for planting, manuring, cultivating, and spraying apple orchards. Considerable space is given to a discussion of the grass-mulch method of cultivating orchards advocated by Grant Hitchings, of New York, and F. P. Vergon, of Ohio. In 1900 an orchard was planted at the station to test the grass-mulch method in comparison with the usual method of cultivation. So far the results have been very favorable to the grass-mulch theory.

Apple growing in Missouri, J. C. Whitten (*Missouri Sta. Bul. 61, pp. 105–130, figs. 6*).—Concise popular directions are given for the planting and care of orchards in Missouri, and marketing fruit, with notes on the varieties most suitable for commercial planting. It is stated that Ben Davis and Gano are grown to a greater extent in Missouri than all other varieties put together.

Manuring the banana, M. A. Couturier (*Jour. Agr. Trop., 2 (1902), No. 13, pp. 195–197; trans. in Jour. Jamaica Agr. Soc., 7 (1903), No. 5, pp. 175–178*).—A summary of the practices of manuring bananas in different countries. It is stated that the ash of the stems of the banana contains about 55 per cent of potash, while the ash of the fingers contains about 73 per cent of potash. While tropical soils usually show high percentages of potash, the soils of Central America, Madeira, and Guinea are quite deficient in this element. Soils on which bananas are grown continuously for a series of years are exhausted in the same manner as when other crops are grown and should therefore be given a complete fertilizer containing relatively large amounts of potash.

In Madeira, on volcanic soil, poor in potash and phosphoric acid and rich in nitrogen, a complete fertilizer analyzing 13 per cent of nitrogen, 20 per cent potash, and 16 per cent phosphoric acid has been used with good results. The manure was applied at the rate of about $1\frac{3}{4}$ oz. per plant in a trench made about 18 in. around the stem of the plant. This application is made twice a year. Instead of this fertilizer the author recommends the trial of a manure testing 20 per cent potash and 10 per cent phosphoric acid, using sulphate of potash and mineral superphosphate for the mixture. To reduce the expense of transportation, superphosphate containing 45 per cent phosphoric acid instead of a mineral superphosphate might be used. These should be mixed in the proportion of 344 lbs. of sulphate of potash and 530 lbs. of mineral superphosphate, or 211.2 lbs. of double phosphate per acre. With about 600 plants per acre each plant should receive from 14 oz. to 1 lb. 5 oz., care being taken to place the manure in a trench made around the stem.

In commenting upon this paper Mr. James Neish, translator, states that in growing a few specimens of the Chinese banana (*Musa cavendishii*), he sets out 2 closely-planted circles of the cowbean (*Vigna sinensis*) around each banana, for the purpose of furnishing nitrates to the bananas. The beans are dug into the soil at the period of flowering.

Cultivation and fertilization of peach orchards, M. B. Waite (*U. S. Dept. Agr. Yearbook 1902, pp. 607–626, pls. 6*).—Popular directions for the cultivation and manuring of peach orchards in different sections of the country.

The nursery, C. Baltet (*La pépinière. Paris: Masson & Co., 1903, pp. X + 841, figs. 285*).—This book deals comprehensively with the culture and practices observed in the nursery growing of fruits, forest trees, shrubs, vines, and many tropical plants.

Cold storage, with special reference to the pear and peach, G. H. Powell and S. H. Fulton (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 40, pp. 28, pls. 7*).—Besides a general discussion of the subject of cold storage, particularly as applied to

fruit, an account is given of some experiments to determine the influence of degree of maturity, delayed storage, storing at different temperatures, types of packages, wrapping, etc., on the keeping quality of pears and peaches; also the influence of cold storage on the flavor and aroma of fruit, and the behavior of fruit when removed from storage. Considering the whole country, it is estimated that about 300,000 bu. of pears are stored annually, mostly in the larger Eastern cities.

In the experimental work reported Bartlett and Keiffer pears were the varieties principally used. The Bartlett is a tender variety of good quality, ripening in hot weather. It is withdrawn from storage before cool weather. The Keiffer is a coarse, long keeping, hard pear, ripening in the fall and withdrawn from storage in cool weather. Work with Bartlett pears was carried out in western New York. Full grown but still green fruit was picked early in September and packed in tight and ventilated barrels, in 40-lb. closed boxes, and in slat bushel crates. Part of the fruit in each lot was wrapped in unprinted newspaper and part left unwrapped. Some of the fruit was put in storage within 10 hours after packing and an equal amount held 4 days before placing in storage. In the storage room part of the fruit was kept at a temperature of 32° F. and part at 36° F.

It was found that Bartlett pears packed in a closed 40-lb. box or a slatted crate could be kept in cold storage for 6 weeks in prime condition when stored within 48 hours after picking and placed in a temperature of 32° F. When the fruit was not placed in storage until 4 days after picking there was a loss of 20 to 30 per cent from softening and decay. Bartletts stored at a temperature of 32° F. were in prime commercial condition 4 to 5 weeks longer than when stored at 36° F. When packed in barrels and stored in a temperature of 32° F. soon after picking, the fruit at the center became yellow within 3 weeks, although the outside layers were firm and green. After 5 weeks the fruit at the center of the barrels was soft and of no commercial value, while the outside layers were still in good condition. There was practically no difference in the keeping capacity of the fruit in the tight and the ventilated barrels. The fruit in both the closed 40-lb. box and slatted crate kept uniformly firm and green through the package. The chief advantage derived from wrapping Bartlett pears seemed to lie in the mechanical protection to the fruit rather than in its efficiency in prolonging its season. Wrapping is advised for superior fruit designed for first-class trade.

The Keiffer pears used were selected from orchards in Maryland and Delaware. They were picked at 3 degrees of maturity, beginning when the fruit was two-thirds grown and continuing until it was fully grown and showing a yellowish tinge around the calyx. Part of it was placed in cold storage within 48 hours after picking and part left 10 days in common storage before being placed in cold storage. Duplicate lots were stored at 32 and 36° F., respectively. Some of the fruit at both temperatures was wrapped in parchment paper and unprinted newspaper and some left unwrapped. The packages used were barrels, 40-lb. closed boxes, and $\frac{5}{8}$-bu. baskets.

The results of the experiment show that Keiffer pears may be picked during a period of 3 weeks beginning when they are two-thirds grown and successfully stored until the holidays or much longer if necessary, providing the fruit is handled with the greatest care and placed in cold storage at 32° F. immediately after picking. Pears stored 10 days after picking soon began to discolor and soften at the core, though the outside of the pears appeared perfectly normal. Within 40 to 50 days the flesh was nearly all discolored. The fruit kept 3 months longer at a temperature of 32° than at 36° F. It kept much better in small packages than in barrels. The chief advantage of ventilated packages seemed to be in the greater rapidity with which the fruit cools. Pears stored in open packages for a long time wilt considerably. Closed packages are therefore recommended.

Wrapped fruit kept longer than unwrapped, and wrapping proved especially valuable as the season advanced. Nearly 50 per cent of unwrapped Keiffer pears

had decayed by January 1, while those wrapped in unprinted newspaper and parchment wrappers were still in good condition. Little practical difference was noted in the relative efficiency of tissue, parchment, unprinted newspaper, and wax paper for wrapping fruits. In storing fruits for a long time a double wrapper was more efficient than a single wrapper, a satisfactory combination being unprinted newspaper next to the fruit with the more impervious paraffin wrapper outside. No evidence was deduced from these experiments to show that cold storage injured the aroma or flavor of pears. On the contrary, the quality of the fruit was maintained longer at a temperature approaching the freezing point than at one any higher.

The results secured in these experiments indicate that pears should be picked before they mature and stored as quickly after picking as possible, and that the fruit should be stored at a temperature of about 32° F. unless it is desired to ripen it up slowly at a higher temperature. Small packages which cool very quickly are best. Wrapping prolongs the life of the fruit, protects it from bruising, lessens wilting and decay, and keeps it bright in color. The rapidity with which cold-storage fruit breaks down when placed on the market depends upon the degree of ripeness of the fruit and the condition of the weather.

The peaches used in the experiment were grown in Georgia and Connecticut. They were stored at temperatures of 32, 36, and 40° F., respectively. Various kinds of packages were used and the fruit was picked at 2 different degrees of ripeness. Equal quantities were wrapped and left unwrapped. The results show that when highly-colored firm fruit was placed in the storage house at 32° it could be kept in prime commercial condition for 2 or 3 weeks. After that time the quality deteriorated, though the peaches continued firm and bright in appearance for a month. Mellow fruit when stored deteriorated much more rapidly and unripe fruit shriveled. At the higher temperatures of 36 and 40° the fruit ripened much more rapidly and reached its profitable commercial limit within 1 to 2 weeks. At the lower temperature the fruit kept equally well in all packages for about 2 weeks, after which that in open baskets and Georgia carriers began to show wilting. In 20-lb. boxes the fruit remained firm throughout the storage season. Wrapping the fruit proved a great protection against bruising in transit. Fruit stored at 32° F. for 2 to 3 weeks stood up 2 or 3 days after removal, depending on the weather. It is pointed out in this connection that in shipping peaches those at the top of the car are likely to ripen much more rapidly than those in the bottom layers and hence should be marketed separately. The chief value of cold storage in the peach industry is likely to be found in the temporary storage of the fruit during an overstocked market.

Cold-storage systems (*Amer. Florist, 21 (1903), No. 796, pp. 217, 218*).—A discussion of cold storage in retarding growth of roots and bulbs so that they may be brought into bloom whenever desirable, with a description of 2 systems of cold storage (ammonia and brine) now in use by 2 different floral concerns. For lily of the valley pips the rooms are kept at 25 to 30° F. The temperature for bulbs, it is stated, is maintained at 17° for the first 14 days after the bulbs are stored, after which the temperature is permitted to rise to 24°, where it remains until all the bulbs are used.

Cold storage of fruits and the preservation of exhibition specimens (*Amer. Gard., 24 (1903), No. 443, pp. 384-386*).—The experiences of several experimenters who have been working with fruits in cold storage are summarized and formulas given for preserving fruits for exhibition purposes in liquid. The paper is an extract from Circular No. 2 recently issued by the department of horticulture of the St. Louis Exposition.

Canning, preserving, and evaporating fruits and vegetables, G. McCarthy (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 4, pp. 3-45, figs. 11*).—Estimates are given on the cost of erecting canning factories of different capacities and directions given for the canning, preserving, and evaporating of a large number of varieties of fruits and vegetables. Some suggestions on the making of jellies, marmalade, apple butter, fruit wines, and brandies are included.

The preservation of fruits for exhibition purposes, H. L. Hutt (*Canadian Hort., 26 (1903), No. 8, pp. 321, 322*).—Formulæ are given for preserving fluids in which to preserve different kinds of orchard and small fruits for exhibition at fairs, etc.

Promising new fruits, W. A. Taylor (*U. S. Dept. Agr. Yearbook 1902, pp. 469–480, col. pls. 7*).—Notes on the origin and desirable characteristics of Stayman Winesap and Randolph varieties of apples, Philopena pears, Belle and Willett peaches, Brittlewood and Stoddard plums, and the Jordan almond.

Small fruits: origin, culture, and marketing, G. C. Butz (*Pennsylvania State Dept. Agr. Bul. 111, pp. 65*).—Directions are given for the culture of strawberries, raspberries, blackberries, dewberries, Loganberry, wineberry, Goumi, Buffalo berry, June berry, currants, gooseberries, cranberries, high-bush cranberries, and huckleberries. Notes are given in each instance on the botany of the particular fruit, methods of propagation, insects, and diseases affecting it.

Recent experiences with strawberries, J. T. Roberts (*Amer. Agr., 72 (1903), No. 11, p. 208*).—The author reports that in his experience during the dry strawberry season of 1902 mulched portions of the strawberry field did not withstand drought as well as unmulched. The very finest fruits ripened in beds exposed to the full glare of the sun, the incline being to the east. High sloping land appeared to be most retentive of moisture. The experience gained in renovating an old plat led to the conclusion that it is less expensive to plant out a new bed than to clean out an old one.

The marmalade industry, E. Hotter (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 7, pp. 597–619*).—This contains a discussion of the economic aspect of the marmalade industry, with an account of some experimental work in determining the effect of organic acids on copper and aluminum vessels, and of the effect on sugar cooked with fruits in a vacuum and open kettles.

In order to determine the effect of organic acids when boiled in copper and in aluminum dishes in the same manner as occurs when kettles are used for the manufacture of marmalades and jellies, 2 per cent and 5 per cent water solution of acetic, tartaric, citric, and malic acids, respectively, were evaporated at a boiling temperature (1) directly over a flame, and (2) in a water bath, and the amounts of copper and aluminum dissolved by the acids determined. The results obtained are tabulated. The acetic, citric, and malic acids dissolved a considerably larger amount of copper than of aluminum under like conditions. With the tartaric acid the amount dissolved was about the same in both copper and aluminum dishes. These results are believed to show that it is desirable in the manufacture of marmalade to substitute some metal like aluminum for copper, since salts of the latter are poisonous and injurious to health.

An investigation of the jams and jellies manufactured by 8 English firms showed that only 3 of these firms used cane sugar entirely in their products, the remaining 5 using from 25 to 30 per cent of glucose with cane sugar. Other data are given to show that in the cooking of fruit juice with cane sugar, long continued heat and the fruit acids gradually invert cane sugar and destroy levulose. It was found also that if the finished product obtained from fruit juice, boiled down in a vacuum, contained much over 2 per cent of acid, the product could not be preserved more than a year without showing the formation of caramel and consequent discoloration. An examination of a number of English marmalades showed only 1.5 per cent acid content. Some data are also contained on the amount of juice and its composition obtained by adding water to apple marc and subjecting it to great pressure.

Grape, raisin, and wine production in the United States, G. C. Husmann (*U. S. Dept. Agr. Yearbook 1902, pp. 407–420, pls. 8*).—This includes an account of the early history of grape growing in this country, its gradual development as a commercial industry, and present methods of grape culture for table use, wine, and

raisins. California produces practically all the raisins grown in this country, devoting about 65,000 acres to this industry. The same State leads in the production of wine, though nearly 70 per cent of the sparkling wines are made in the State of New York.

Wine making at home, G. McCarthy (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 4, pp. 16–19*).—Brief directions are given for manufacturing red wines, and a recipe for cordials.

Fertilizing the vineyard, E. H. Twight (*Pacific Rural Press, 66 (1903), No. 7, p. 100*).—Fertilizer formulas and methods of working them out for vineyard application are given.

The agaves, a remarkable group of useful plants, E. W. Nelson (*U. S. Dept. Agr. Yearbook 1902, pp. 313–320, pls. 4*).—The range of culture of these plants, methods of growth, and uses for food, drink, soap, fiber, etc., are discussed.

The flower garden, Ida D. Bennett (*New York: McClure, Phillips & Co., 1903, pls. 34, pp. 257*).—This book contains considerable information on the culture of hardy outdoor ornamentals, and suggestions on tools, equipment, and methods of work. Chapters are given on annuals from seed, on vines, bulbs, and tuberous-rooted plants, aquatics, hardy lilies, window boxes, foliage plants, roses, and shrubs. There are also chapters on the location and arrangement of the garden, soils, fertilizers, etc.

Home floriculture, E. E. Rexford (*New York: Orange Judd Co., 1903, pp. 300, figs. 72*).—This book is intended as a practical guide to the care and management of flowering and other ornamental plants of the house and garden. The subject is discussed from the standpoint of the amateur.

Plants as a factor in home adornment, L. C. Corbett (*U. S. Dept. Agr. Yearbook 1902, pp. 501–518, pls. 3, figs. 3*).—This article discusses the aesthetic value of plants, their arrangement for adornment about the home, and gives the characteristics of a large number of shrubs and deciduous trees and plants used in landscape gardening.

Lilac forcing in France (*Gardening, 11 (1903), No. 263, pp. 354, 355, figs. 3; 12 (1903), No. 265, pp. 385, 386, figs. 5*).—An account of French methods of forcing lilacs.

Blind versus flowering wood for rose cuttings, L. C. Corbett (*Amer. Florist, 20 (1903), No. 773, pp. 298–300, fig. 1*).—The author studied the effect on flower production of growing roses from cuttings made from blind wood and from flowering wood, respectively. By blind wood is meant a branch of the rosebush which is terminated by a leaf instead of a flower bud. The experiment was carried on for 5 years. Each year the flowering wood for propagation was selected from plants grown from flowering wood, while the blind wood was taken from plants propagated from blind wood. It was intended in this way to study the cumulative effects of propagation through a series of years.

As between the blind-wood and the flowering-wood cuttings, little difference was found in their respective tendencies to form roots. The plants also grew with equal vigor. During the first year of the experiment plants propagated from flowering wood produced 156 per cent more flowers than plants propagated from blind wood. During the second and succeeding seasons the percentage of flowers produced from the flowering wood decreased instead of increasing. The percentage of flowers produced on the blind-wood plants also decreased but not in so great a proportion. The average number of flowers per plant obtained with 2 varieties for the season December 1 to May 31 for 5 years is as follows: *Bride*—from blind wood 8.26, from flowering wood 16.59; *Bridesmaid*—from blind wood 12.29, from flowering wood 16.98.

In order to test the relative merits of new plants produced from cuttings and plants 2 years old, a number of plants produced from blind and from flowering wood were left in the greenhouse over summer. These were severely pruned back and part of the earth in the benches replaced with fresh soil. The pruned plants were afterwards slowly started into growth. They produced most of their crop in the fall and

early winter while the cutting plants produced the heaviest bloom later in the season. The question as to which method is best will therefore depend upon the time the flowers are in greatest demand.

As a result of these experiments it is believed that, where bloom rather than stock plants is desired, the test is emphatic in showing the desirability of plants propagated from flowering wood. The cumulative effects of propagating roses from blind wood or from flowering wood year after year is not marked.

The propagation of the Easter lily from seed, G. W. OLIVER (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 39, pp. 24, pls. 7*).—The author advocates the growing of Easter lilies from seed rather than from bulbs as one method of avoiding the troublesome lily diseases. Reproduction from seed is shown to be entirely practicable and as rapid as from bulbs. Illustrations are given of seedling lilies in bloom 6 months and 13 days after germinating. Detailed directions are given for pollinating flowers, sowing the seeds, and the future care of plants.

Fertilizer experiments in 1899 with Chrysanthemum indicum, variety Viviand Morel, M. HOFFMANN (*Gartenflora, 52 (1903), Nos. 11, pp. 297–305; 12, pp. 315–319; 13, pp. 347–352, figs. 6*).—Pot fertilizer experiments with chrysanthemums were made at 4 different stations in Germany and the results obtained are here detailed. A soil of fair quality was used in each experiment. One pot was left unfertilized as a control. Fertilizers were added to 4 other pots in the liquid used for watering as follows: (1) Sulphate of ammonia in the proportion of 1 to 200; (2) sulphate of ammonia in the proportion of 1 to 50; (3) liquid manure in the proportion of 1 to 10; and (4) liquid manure in the proportion of 1 to 10, bone meal 1 to 200, and sulphate of ammonia 1 to 2,000. The experiments covered a period of 234 days. The plants were transplanted 4 times. Careful data were taken of the height of the plant, number of branches, color, width and length of the leaves, total weight of all the different parts at maturity, and the nitrogen content of the best of the largest and of the smallest roots, branches, leaves, and flowers. These data are all tabulated.

In general the nitrogen content of the leaves and flowers was about 3 times as great as the nitrogen content of the roots and branches. The best plants in these experiments were obtained by the use of sulphate of ammonia in the proportion of 1 to 50; following this came the plants fertilized with sulphate of ammonia in the proportion of 1 to 200, and then those fertilized with liquid manure to which bone meal and sulphate of ammonia had been added.

The book of the daffodil, S. E. BOURNE (*London and New York: John Lane, 1903, pp. XII+112, pls. 18, figs. 4*).—Cultural directions are given for the daffodil or narcissus, with descriptions of a large number of different varieties and notes on how to form a collection, exhibit specimens, and judge them at shows. This is the sixteenth of the series of Handbooks of Practical Gardening edited by H. Roberts.

Spraying to kill pond scum, H. P. HEDRICK (*Gardening, 11 (1903), No. 259, p. 295; Amer. Florist, 20 (1903), No. 785, p. 750*).—The green matted growth of low water plants which is frequently found in fish ponds, lily ponds, and water gardens, and which is usually got rid of by raking off and carting away, was destroyed by the author by spraying with Bordeaux mixture. The mixture was first applied full strength about August 1; 24 hours afterwards the green scum had turned brown and in another day had sunk to the bottom of the pond and the water was perfectly clear. Water lilies were slightly injured by the spray, showing that the Bordeaux mixture was a little too strong.

When the Bordeaux mixture was applied about $\frac{3}{4}$ full strength the same result was obtained with the green scum, with no bad effects to the lilies. After the first spraying it was about a month before a second was required. Fish and frogs in the pond did not appear to be injured by the spraying, while it is believed that the breeding of mosquitoes was materially checked. The author recommends a spray composed of 4 lbs. of copper sulphate, 4 lbs. of unslaked lime, and 60 gal. of water.

FORESTRY.

Reforestation, H. H. CHAPMAN (*Minnesota Sta. Bul. 81, pp. 247, 248*).—In order to investigate the cost and practicability of restocking with pine land which is too hilly, rocky, or sandy for agricultural purposes, a number of acres were laid off at the Grand Rapids Substation and planted in 1900 to white and Norway pine. The trees had been grown 2 years in nursery rows and were a size too large for successful planting. The cost of planting depended upon the distance between the trees. When set at intervals of 4 ft. the cost was $11.20 per acre. At 6-ft. intervals the cost was $5.60, at 8-ft. intervals $3.14, and at 10-ft. intervals $2.50 per acre. Notwithstanding the prolonged drought of 1900 nearly 95 per cent of the trees have lived and are now reported to be making rapid growth. In all 12.5 acres were planted, each acre representing a different type of planting. Four acres were pure white-pine plantation, 4 of Norway pine, and other areas of mixed plantings of white, Norway, and jack pine. An acre was also planted to test the relative merits of Norway and Scotch pine for Minnesota conditions.

Practicability of forest planting in the United States, W. L. HALL (*U. S. Dept. Agr. Yearbook 1902, pp. 133–144, pls. 4*).—According to the author forest planting can not be considered practicable throughout the entire United States, but there are a number of regions in which it is feasible. The considerations which determine the practicability of planting are the present supply of useful timber, the necessity of forests to provide shelter, protect the soil or conserve moisture, the capacity of a forest to produce another crop, the value of the ground for purposes other than forest growth, protection against fire or other serious injuries, and the probabilities of a fair return upon the investment.

When these factors are considered the author believes that planting is at present impracticable throughout the greater portion of the hardwood region of the eastern United States and the spruce forests of the Northeast, as well as the heavily timbered portions along the Pacific coast. In the eastern States under present conditions planting is considered desirable as farm wood lots, upon impoverished farm lands, and on cut-over nonagricultural lands. An estimate of costs and returns per acre from land planted to white pine, based upon 60,000 measurements of white pine, shows an average annual return of $2.25 per acre during a 40-year rotation. This estimate for white pine is believed to be applicable to red pine and Norway spruce over the greater portion of New England. In the middle West planting is recommended for cut-over portions of the white-pine belt, and wood lots throughout the agricultural regions. In the western States it would be confined largely to mountain areas, for the protection of watersheds and other irrigation works.

Forest planting on the plains, E. P. SANDSTEN (*Forestry Quart., 1 (1903), No. 4, pp. 140–144*).—An account is given of some of the earlier experiments in forest planting in the Sand Hill region of Nebraska, begun under the supervision of the Division of Forestry of this Department in 1891. They were carried out in Holt County, Nebr., where a considerable area was planted with bull pine, Scotch pine, and Banks' pine, and a variety of deciduous species, such as black locust, birch, box elder, cherry, and red oak were also planted. The condition of the trees as shown after 12 years is stated. The larger trees of the Banks' pine are from 15 to 20 ft. high, the Scotch pine from 4 to 12 ft., and the bull pine from 3 to 8 ft. The grove at present is dense in growth and fully covers the otherwise almost worthless sand hills. It is said that on the success of this early planting was largely based the recent establishment of the forest reserve in western Nebraska, which is to be planted under the supervision of the Bureau of Forestry.

Foresting in Nebraska sand hills, C. A. SCOTT (*F[illegible] (1903), No. 9, pp. 454–457, figs. 5*).—Notes are given on the progress of the work of the

Bureau of Forestry in its attempt to forest the sand hills in the western part of Nebraska. The Bureau having decided to grow its own nursery stock, a description is given of the preliminary efforts made to provide the necessary grounds. These have been covered with slat shades, and a large quantity of red cedar, jack pine, etc., has been seeded in these beds.

The pine lands of the South, H. C. PUTNAM (*Forestry and Irrig., 9 (1903), No. 9, pp. 446–452*).—A description is given of some of the pine lands of the South, attention being called to the possibilities of scientific forestry in promoting forest production in the Southern Atlantic Coast States. The necessity for the protection of the present forests from fire, destructive lumbering, etc., is pointed out, and the possibilities of handling the forest so as to produce a continuous crop is shown.

Forest problems in New Hampshire, P. W. AYRES (*Forestry Quart., 1 (1903), No. 4, pp. 221–225*).—The leading problems in New Hampshire forests are said to be the reforesting of white-pine areas, and the maintenance of the spruce output. Recent statistics show that nearly 2,000,000 acres of land have reverted from improved farm land to an unimproved state, and much of this is adapted to the growth of white pine. The author suggests the planting of areas upon which no reforestation has taken place, thinning when necessary, reforesting the cut-over areas, and extending the forest area over all lands which are not adapted to agricultural crops.

The question of the management of the spruce forests is a complicated one, and the author believes that the establishment of permanent reserves, which are to be economically managed, would aid in showing the possibilities of scientific forestry.

The New York forest-fire law, C. R. PETTIS (*Forestry Quart., 1 (1903), No. 4, pp. 134–139*).—The text of the New York forest-fire law is given, and the author discusses the duties of the different officers who are made responsible for its enforcement.

The forests of Canada, H. S. CULVER (*Forestry and Irrig., 9 (1903), No. 6, pp. 288–292*).—A description is given of the present condition of the timber areas of Canada, the author dividing the region into 3 great timber belts—the northern or spruce belt, the southern or commercial belt, and the British Columbia belt, which is west of the Rocky Mountains. The principal species of trees in these different regions are described and notes given on their proportionate abundance and their forest relations.

Investigations on the introduction of exotic forest trees in Prussia and Austria, R. HICKEL (*Ann. Sci. Agron., 2. ser., 1 (1903), No. 1, pp. 142–160*).—An historical review is given of attempts which have been made to introduce exotic species of forest trees in the forests of Prussia and Austria. Lists are given of the different trees introduced, most of the species being American, the author dividing them into 3 groups based upon their adaptability. Among the species found adapted to European forest cultivation are *Pseudotsuga douglasi*, *Picea sitchensis*, *Chamæcyparis lawsoniana*, *Thuya gigantea*, *Juglans nigra*, *Carya alba*, *C. amara*, and *Quercus rubra*. A second group of species which are not adapted to as wide range of conditions but which are suited to cultivation in restricted regions includes *Pinus rigida*, *Juniperus virginiana*, *Abies nordmanniana*, *Pinus laricio*, *Acer saccharinum*, *Betula lenta*, *Carya tomentosa*, and *C. porcina*. The following species are not considered worth further investigation: *Pinus jeffreyi*, *P. ponderosa*, *Acer dasycarpum*, *A. californicum*, *Fraxinus pubescens*, and *Carya sulcata*. A table is given showing the extent to which these different species have been introduced in the state forests of Germany between 1890 and 1900, and a review is also given for the introduction of similar species in Austria. After reviewing the conditions in general the author takes up a number of species describing them and giving the results of the attempts made to cultivate them. The present publication is confined to species of fir and spruce.

The forest flora of New South Wales, J. H. MAIDEN (*Sydney: Govt., 1903,*

pt. 3, pp. 55-74, pls. 4).—Botanical descriptions and notes are given of a number of Australian timber trees, together with their distribution and their timber characteristics and uses. The species here described are the red cedar (*Cedrela australis*), red mahogany (*Eucalyptus resinifera*), and the she-beech (*Cryptocarya oborata*).

Forestry at Hongkong, M. WINCHESTER (*Forestry and Irrig., 9 (1903), No. 6, pp. 280-284, figs. 4*).—The author states that in 1842, when Hongkong was ceded to Great Britain, the surrounding country was practically barren of vegetation. In 1878 planting was begun, the most extensive work being the setting out of 5,000 cocoa palms. By 1880 it had become demonstrated that trees could be made to grow on the exposed slopes; and in 1881, instead of planting nursery plants as heretofore, an attempt was made to produce the Chinese white pine by planting the seeds in place. This proved successful and was accomplished at about one-fifth of the cost of the nursery plan. Since that time a number of varieties of trees have been planted, and, although the Chinese white pine is the most prominent species, a large number of others are well represented. The region about Hongkong has become reforested, and but little is now done by the forest department aside from broadcasting seed and occasional planting to fill up areas where trees have for some reason been destroyed. This experiment is believed to be a practical demonstration of the feasibility of tree planting about large cities on hilly and rocky soils.

Administration report of the forest department of the Bombay Presidency, W. A. TALBOT, T. B. FRY, and R. S. F. FAGAN (*Forest Dept., Bombay Presidency, India, Rpt. 1901-2, pp. 98 + LXXVIII*).—This is a combined report of the Northern, Central, and Southern Forest Circles of the Bombay Presidency, covering the forest year 1901-2. The reserve forest area described embraces 11,959 square miles, divided as follows: Northern Circle, 1,434 square miles; Central Circle, 6,251 square miles, and Southern Circle, 4,274 square miles. In addition to the above areas, 1,250 square miles are designated as protected forest area. The changes in the various tracts during the year are noted, slight additions being indicated. Detailed accounts are given of the surveys made during the period covered by the report, and statements regarding the working plans and systems of forest management. The amount and value of the different kinds of forest products are tabulated, with comparisons of the previous years. A brief report on the forests of Sind is added.

Progress report on the forest administration in Coorg, C. D. MCCARTHY (*Forest Dept., Coorg, India, Rpt. 1901-2, pp. 27*).—The classified forest area under reservation on the 30th of June, 1902, is said to be 404,590 acres. A detailed report is given of the management of the forest lands, the means adopted for the prevention of forest fires, and the regulations concerning grazing and the use of the forest products. The gross returns are given, showing a considerable increase over previous years.

The locust, W. L. HALL (*Forestry and Irrig., 9 (1903), No. 6, pp. 307-309, fig. 1*).—The range, habits, and methods for planting the yellow or black locust (*Robinia pseudacacia*) are described. This tree, originally indigenous to the mountains from Pennsylvania to Georgia, has become widely naturalized throughout the United States east of the Rocky Mountains, and has proved itself adapted to some of the valleys of the farther Western States. The rate of growth is rapid, particularly in rich soils where the annual increase is from 2 to 4 ft. in height and $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. This rate of growth diminishes after about 30 years, and the trees become mature in about 50 years. At this time they average from 40 to 80 ft. in height, with a diameter of 2 to 3 ft.

The timber of the locust has been found adapted to use as fence posts, in construction, for telegraphic insulators, and in the manufacture of vehicles. Its most common use is for fence posts, for which purpose it has been extensively planted. A post 4 to 5 in. in diameter may be produced on good soil in from 7 to 8 years, and will last from 8 to 15 years.

The locust is easily propagated, either from root cuttings or seed, and the seed retains its vitality for a number of years if buried deep in the ground. The seed should be drilled in well pulverized rich soil early in the spring, and the subsequent method of management will be determined by the purpose for which the plantation is made. In most cases the trees should stand 4 by 4 or 6 by 6 ft. apart. While the locust grows well in pure plantations, the best success usually follows where it is mixed with some heavy foliage tree such as osage orange, hardy catalpa, white elm, etc. It is a good tree to plant in mixtures with black walnut, the 2 species standing in alternate rows. At the expiration of about 15 years the locust in this case should be cut out for fence posts, leaving the black walnut for the final stand.

The poplars, C. Durieux (*L'Ing. Agr. Gembloux, 13 (1903), No. 11, pp. 500–511*).—The author describes poplars as forest trees, giving extended notes on *Populus alba*, *P. tremula*, *P. nigra*, and *P. canadensis* or *P. monilifera*. The reproduction of these different species is described and suggestions given for their propagation in the nursery and in permanent plantations.

Some Eucalyptus hybrids in the Mediterranean region, J. Trabut (*Rev. Hort. [Paris], 75 (1903), No. 14, pp. 325–328, figs. 3*).—The author gives a description of several well characterized hybrids of Eucalyptus which have originated in the region about the Mediterranean Sea. Most of these are said to be more vigorous and much better adapted to their surroundings than the species from which they were descended.

Japanese bamboos and their introduction into America, D. G. Fairchild (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 43, pp. 36, pls. 8*).—This bulletin discusses the importance of the bamboo industry in Japan, Japanese methods of propagating bamboos and managing bamboo groves, profits in the business, localities in the United States where the industry is likely to succeed, and gives popular descriptions of a large number of different varities and species of bamboos.

The subject is discussed primarily from the standpoint of bamboo as a forest tree. Methods of growing the edible bamboo are also described and some recipes given for its preparation for the table. It is stated that some species of bamboo will stand a temperature of 6° F. It is believed that there are in California, Oregon, Texas, and throughout the Gulf and Southern States many locations suitable for the culture of bamboo.

Studies of trees in winter, C. K. Schneider (*Dendrologische Winterstudien. Jena: Gustav Fischer, 1903, pp. VI+290, figs. 224*).—An account is given of the winter aspect of more than 400 species of trees and shrubs which are native and introduced in Germany. Keys are given based upon the bud, leaf scar, and structural characters, by which the different species in their winter condition may be determined.

Chemical studies of some forest products of economic importance, W. H. Krug (*U. S. Dept. Agr. Yearbook 1901, pp. 321–332*).—Studies have been begun on various forest products, such as tanning materials, resins, gums, etc., and a report is given of some of the investigations thus far carried on regarding the composition of American woods and barks. The analyses given show the moisture, total cellulose, xylan, soluble contents, tannin, ash, etc., for a number of specimens of the western hemlock (*Tsuga heterophylla*), red oak (*Quercus rubra*), chestnut oak (*Q. prinus*), white oak (*Q. alba*), and black oak (*Q. velutina*). Notes are also given on studies of the anatomy and histo-chemistry of oaks and an account of investigations of turpentine adulteration.

Numerous complaints have been made of the unsatisfactory behavior of turpentine oils, and a number of samples of oils from different sources were subjected to examination. Several specimens were found to contain adulterants, the principal adulterating material being petroleum in some of its fractions. When the lower boiling fractions, such as gasoline, were used, the specific gravity of turpentine was lighter, and, to counteract this, resin was added.

Notes on the occurrence of mannan in the wood of certain trees and in various roots and fruits, F. H. STORER (*Bul. Bussey Inst., 3 (1903), III, pp. 47–68*).—In continuation of a previous article (E. S. R., 14, p. 21), the author gives the results of his investigations on the occurrence of mannan in the wood of various trees, roots, and fruits. In the earlier publication the conclusion was reached that mannan was probably more abundant in pine trees at certain seasons of the year than others. In investigating this subject specimens were collected monthly during a year from a young, thrifty white-pine tree and subjected to examination by methods which are fully described.

It was found that pines, and presumably other coniferous trees, contain late in summer and early in autumn a large reserve supply of mannan. The physiological relation of this substance is somewhat obscure, but it is thought that it probably serves as a reserve food for the formation of new leaves to take the place of those which fall at the end of the season, or it may serve for the nourishment and growth during the winter of those leaves which, with the advent of spring, cause the falling off of the older foliage. The presence or absence of mannan in the wood of 17 other species as well as in the leaves, fruit, and other portions of a number of plants is indicated.

Tests on the physical properties of timber, F. E. OLMSTED (*U. S. Dept. Agr. Yearbook 1902, pp. 533–538, pls. 2*).—An outline is given of the timber testing work carried on in Europe, and a brief review of the timber tests that have been conducted in the United States, particularly those made some years ago by this Department as well as the ones conducted by other institutions. It is the intention to continue timber testing observations, and they will be made on a large scale representing different conditions of the timber market and of timber cutting. The experiments will be conducted on such a scale that the results obtained will be comparable and valuable to the lumber industry.

Factors influencing the volume of solid wood in the cord, R. G. ZON (*Forestry Quart., 1 (1903), No. 4, pp. 126–133*).—With the rapid development of the pulp industry, the importance of the accurate determination of the contents of stacks of wood has been largely increased. A number of factors which influence the volume of solid wood in the measured cord are mentioned, and their varying effect is shown. The principal factors described are length and diameter of the sticks, their form, the species, method of piling, measuring, etc. Tables are given showing the volume of wood in stacks, the computations being made for different lengths, diameters, and classes of wood.

The influence of forestry upon the lumber industry, O. W. PRICE (*U. S. Dept. Agr. Yearbook 1902, pp. 309–312, pls. 3*).—The author states that the lumber industry ranks fourth among the manufacturing industries of the United States, representing an invested capital of \$611,000,000, an annual outlay of more than \$100,000,000 in wages, and an annual value of products of \$566,000,000. Under the present system of cutting this production can not be long sustained, and the author seeks to show how, under conservative methods of lumbering, the industry may be prolonged and placed upon a stable basis. One of the results under a scientific system of management would be the elimination of the large sawmills and the erection of small mills in various localities. It would also tend to develop a class of trained forest workers such as are found in Europe, and by providing a steady supply of lumber it would cause less fluctuation in the market prices.

The forest and irrigation, HEFELE (*Bul. Col. Agr. Imp. Univ. Tokyo, 5 (1903), No. 3, pp. 345–371*).—The importance of forest growth as a conserver of water is discussed.

A bibliography of forestry, O. WILLIAMS (*Forestry Quart., 1 (1903), No. 4, pp. 163–172*).—A list of titles of articles relating to forestry which were published in United States Congressional documents and printed in what is commonly designated as the "sheep set."

SEEDS—WEEDS.

Report on the introduction and distribution of seeds and plants by the bureau of agriculture, W. S. Lyon (*Philippine Bureau Agr., Farmers' Bul. 7, pp. 18, pls. 3*).—A report is given of the introduction and distribution of seeds and plants, most of which were field and forage crops and vegetable seeds. The origin of the different varieties of plants is given, many of them being introduced for testing their adaptability to Philippine conditions.

The seeds of rescue grass and chess, F. H. Hillman (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 25, pp. 5–8, figs. 3*).—This has been noted from advance sheets (E. S. R., 14, p. 875).

Report of the section of seed control for the year ended June 30, 1902, A. Voigt (*Bot. Staatsinst. Hamburg, Ber. Abt. Samenkontrolle, 1902, XI, pp. 10*).—In this report the author gives an account of the investigations carried on by the section of seed control which is attached to the botanical institute of Hamburg. During the year covered, 2,760 separate investigations were made, the most of which were of clovers and other forage plants. The results of the different tests are shown in tabular form, and in general a decided improvement is noted in the purity and germinative vitality of the different samples of seeds over the results obtained the previous year. Investigations on the presence of dodder in different forage plants showed about 34 per cent to contain dodder seed in greater or less abundance. Notes are given on the various samples of seed investigated, the author commenting upon their quality.

Report of the Agricultural-Botanical Experiment and Seed-Control Station at Breslau, 1903, W. Remer (*Ber. Tät. Agrbot. Vers. Samenkontrollstat., Breslau, 1903, pp. 16*).—A report is given of the seed investigations carried on under the auspices of the seed-control station of the Agricultural Society of Breslau for the year ended March 31, 1903, 3,957 samples of seed having been examined. The maximum, minimum, and average percentage of purity, germination, and intrinsic worth of the different varieties of seeds are shown in tabular form. There were examined during the year 2,390 samples of red clover, 388 white clover, 473 alsike, 187 timothy, 67 alfalfa, 68 serradella, and a lesser number of a great many other varieties of seed.

The report also shows the presence of dodder seed in different samples of forage plants, the seeds of this parasite being found in 36.4 per cent of the samples of red clover, 26.2 per cent of white clover, 31.1 per cent of alsike, 15 per cent of yellow clover, 26.4 per cent of serradella, and 25.6 per cent of timothy seed. Brief notes are also given on plant diseases and other botanical subjects. The occurrence of many diseases of cereals, beets, potatoes, and other plants is noted, and suggestions are given of possible means for their prevention.

Troublesome weeds, J. B. Davy (*Transvaal Agr. Jour., 1 (1903), No. 4, pp. 110–112*).—Notes on the burrweed (*Xanthium spinosum*) and sida (*Sida rhombifolia*), and suggestions for their eradication.

Wild mustard, J. R. Anderson (*Dept. Agr. British Columbia, Bul. 11, pp. 12, figs. 2*).—A description is given of the wild mustard (*Brassica sinapistrum*) which is widely spread through Canada and which is probably one of the worst weeds occurring in the grain fields of that region. The methods of distribution of this weed are noted and suggestions made for its eradication by spraying with copper sulphate or iron sulphate solutions.

Eradication of wild mustard, H. Hitier (*Jour. Agr. Prat., n. ser., 5 (1903), No. 21, pp. 658, 659*).—A review is given of 3 years' experience in spraying fields of cereals for the eradication of the wild mustard. The various methods described include spraying with a solution of 3½ to 4 per cent copper sulphate, 2 to 3 per cent copper nitrate, 20 per cent iron sulphate, and 20 per cent sodium nitrate added to a 2 per

cent solution of copper sulphate. All of these treatments are said to be efficient for the destruction of wild mustard, wild radish, and other troublesome weeds and but slightly injurious to the cereals. When sprayed over the fields the extremities of the leaves of the cereals are slightly affected, but so far no injury has been observed to young leguminous plants such as clover, alfalfa, sainfoin, etc., which are seeded with the cereals.

Destruction of wild mustard, J. VANDERVAEREN (*Jour. Agr. Prat., n. ser., 5 (1903), No. 23, pp. 731, 732*).—The author describes a method of combating wild mustard which has been quite generally practiced in Belgium and which has thus far given excellent results. It consists in the distribution of 200 kg. of dry powdered sulphate of iron per hectare. This gives results equal to those where the herbicide is dissolved and sprayed over the fields, and is said to be not only cheaper but not to necessitate the use of as high-priced machinery for its application. The cost of spraying varies from 20 to 30 francs per hectare, depending on the material used, while the powdered sulphate of iron can be applied at a price not to exceed 12 francs per hectare. The copperas should be fresh and finely powdered, the hygroscopic sulphate of iron not being as efficient.

Destruction of wild mustard, D. DONON (*Jour. Agr. Prat., n. ser., 6 (1903), No. 30, pp. 110, 111*).—The result of experiments with a $2\frac{1}{2}$ per cent solution of copper sulphate and a 10 per cent solution of nitrate of soda is given, comparisons being made with untreated plats and those which had been sprayed with a 5 per cent solution of copper sulphate. The reduction of the amount of copper sulphate and addition of the nitrate of soda was equally as efficient in the eradication of mustard and was without injurious effect upon the crop. Indeed, the addition of the nitrate of soda is believed to have had a beneficial effect when applied to oats. The nitrate of soda alone is not as efficient as copper sulphate, but when the two were combined the results obtained were highly satisfactory. The application of this herbicide twice during the season, at the rate of 400 liters per hectare, practically destroyed all the wild mustard.

DISEASES OF PLANTS.

Twelfth annual report of the special committee for plant protection, 1902, P. SORAUER and M. HOLLRUNG (*Arb. Deut. Landw. Gesell., 1903, No. 82, pp. XXVIII + 214*).—This report gives the results of observations of a large number of vegetable pathologists and others upon the plant diseases occurring in Germany during 1902. After giving a review of the weather conditions for the year, the fungus and insect enemies of the different plants are noted, their distribution and amount of injury indicated, and where means have been adopted for combating them the results are given. The diseases are grouped under the principal headings of plant and animal enemies of cereals, beets, potatoes, leguminous plants, oil, vegetable and forage plants, fruit-producing plants, and grapes. A supplement is added in which is given a summary of the results of various preventive treatments, and the report concludes with a discussion on the predisposition of some plants to parasitic diseases.

Some diseases of cultivated plants, F. CORBOZ (*Bul. Soc. Vaud. Agr. et Vit., Lausanne, 1903, Nos. 162, pp. 323–329; 163, pp. 351–355*).—An account is given of various diseases of plants, grouping them under their respective causes. The author discusses those which are due to impoverishments in the physiological functions of the plant, those which are caused by meteorological conditions, temperature, electricity, etc., and those due to plant parasites. Among the plant parasites he describes not only the diseases caused by parasitic fungi, but parasites belonging to the higher orders of plants.

Disease-resisting varieties of plants, L. LEWTON-BRAIN (*West Indian Bul., 4 (1903), No. 1, pp. 48–5[illegible]*).—The author discusses the topic of disease-resistant varie-

ties of plants, describing what has been done in different parts of the world to obtain resistant varieties of grapes, wheat, cotton, coffee, potatoes, cowpeas, sugar cane, and violets.

Frost injuries to cereals in relation to fungus diseases, P. SORAUER (*Landw. Jahrb., 32 (1903), No. 1, pp. 1–68, pls. 4, fig. 1*).—On account of the unusual occurrence of fungus diseases of cereals during a season following a number of severe late frosts, a series of experiments was undertaken to ascertain the effect of frost and its relation to fungus diseases of cereals. The mechanical effect and physiological changes caused by freezing are described at considerable length.

Inoculation experiments with quite a number of parasitic fungi upon frost-injured plants and the effect of different times and conditions of seeding are reported upon. The author found certain injuries that could be attributed only to frost injury, but which resembled in their characteristics certain fungus diseases. Such, for instance, is the state of cereals known as blast, white heads, etc. Serious injury due to frost may be observed that in its earliest stages does not present any fungus mycelium, but later parasites may attack the plants. There are some fungi now believed to be obligate parasites which occur on sound healthy plants as well as upon those whose organs have become weakened from any cause whatever. The presence of some of the less active parasitic forms may be due to frost or other injuries in offering opportunity of entering the tissues of the host.

Care in sowing sound seed, although desirable and tending to reduce the amount of disease, will not wholly eliminate diseases in every case. Some wild grasses are hosts for some of the more destructive fungi of cereals, and their presence on these grasses may serve as a center to spread the infection. Plants weakened from any cause whatever are more subject to serious injury than healthy ones.

Preliminary observations on disease of cereals in Tunis, F. BŒUF (*Bul. Dir. Agr. et Com. [Tunis], 8 (1903), No. 27, pp. 185–193, figs. 5*).—The author describes a number of diseases which have appeared on wheat, barley, and oats in Tunis, and gives the results of determinations of the fungi which have been made at the Colonial School of Agriculture. The fungi present were *Erysiphe graminis, Puccinia rubigovera, P. graminis, Septoria tritici, Sphæroderma damnosum,* and *Cladosporium herbarum.* The principal injury seems to be caused by the Sphæroderma, and its appearance on the different plants is fully described. The development of the diseases, the influence of soil humidity and temperature, etc., are pointed out.

On the specialization of Erysiphe graminis, E. MARCHAL (*L'Ing. Agr. Gembloux, 13 (1903), No. 10, pp. 457, 458*).—In continuation of the previous paper on this subject (E. S. R., 14, p. 667), the author reports that as a result of further inoculation experiments he is convinced that there are definite forms of this mildew which are specialized upon certain cereal host plants.

Experiments for smut prevention, D. N. PRYANISHNIKOV (*Khozyain, 1902, No. 20, pp. 647–652; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 1, p. 112*).—The results are summarized as follows: Soaking during 12 hours in 0.5 per cent solution, or 6 hours in 1 per cent solution of copper sulphate, completely destroyed the smut. Soaking for 5 or 10 minutes in 0.125 per cent solution of formalin is insufficient; greater concentration should be tried (according to David an hour's soaking is required in 0.125 per cent solution). Formalin vapors applied in sufficient quantity destroy the smut, but when applied to large quantities of grain it is difficult to cause the vapors to thoroughly permeate the interior of the mass.

As to the influence of the different kinds of soaking on the germination of wheat, the experiments showed that 0.5 per cent solutions of copper sulphate is endured without great harm (after 12 hours soaking 91 per cent of the seeds germinate), while solutions exceeding 0.5 per cent are not suitable for protracted soaking. (1 per cent solution lowered the germination to 66 per cent.)—P. FIREMAN.

Combating oat smut, H. ROMMETIN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 31,*

p. 145).—The results of the author's investigations on the prevention of oat smut by treatment of the seed with hot water are given. He has followed this method for a number of years, and is convinced that with ordinary care it is possible by treating the seed with water heated to 54° C. and sowing on clean soil to produce a crop which may be used for seed the subsequent year without treating. This may be continued for a third year if attention be paid to the thrashing machines and other implements so that the fungus spores may not be carried to the new crop.

Investigations in cereal rusts, E. MARCHAL (*L'Ing. Agr. Gembloux, 13* (*1903*), *No. 11, pp. 473–500*).—This is a résumé of an article by the same author, previously noted (E. S. R., 14, p. 1083).

Concerning the seed treatment of cereals with copper sulphate, F. PORCHET (*Chron. Agr. Canton Vaud, 16* (*1903*), *No. 12, pp. 352–357, fig. 1*).—On account of the rather common use of copper sulphate in solution for the prevention of cereal smuts, the author has made a study of the protective effect of the glumes of certain cereals, such as oats and barley. He conducted his experiments with equal numbers of seeds with and without the protective glumes, comparing the effect of treatment with wheat which was without the glumes. The seeds were soaked for 24 hours in a 0.5 per cent solution, after which they were placed to germinate.

The effect of the treatment where the glumes were removed was apparent in the greatly reduced germinations of oats, the number falling from 91 to 53 in 28 days. Not only was the number greatly reduced, but the copper sulphate seemed to effect a retarding influence, a comparatively small number of seeds having germinated within the first week of the experiment. The germinations of oats from which the glumes had been removed, and wheat which was without any protective covering, showed but little difference when soaked in the solutions for the same length of time.

The browning of maize in France, V. DUCOMET (*Jour. Agr. Prat., n. ser., 5* (*1903*), *No. 16, pp. 507–511, figs. 4*).—A description is given of a disease of maize which has proved very destructive in the southwest of France, where this crop is extensively grown for green forage. The disease is characterized by the drying up of the leaves, and at first is quite localized, but spreads after a time, and in about 15 days the entire field may become completely browned and dried up. On account of the peculiar browning or burnt condition of the leaves the author has suggested the name "brûlure" for the disease.

The disease makes its appearance upon the leaves when the plants are from 20 to 30 in. in height as small discolored spots which rapidly increase until they attain a diameter of 2 cm. and a length of 6 or 7 cm. The spots are for a while limited by the veins in the leaves, the long diameter of the spot being parallel with the veins. Frequently the tips of the leaves are involved, and finally by the confluence of a number of spots the entire leaf is destroyed. About 15 days after the appearance of the first symptoms of the disease the spots occur in great abundance on both sides of the leaves, and from their centers appear numerous dirty, gray, cushion-like masses which are the reproductive organs of the fungus.

The life history of the fungus, which has been determined as *Helminthosporium turcicum*, is described at considerable length. In order to prevent the spread of this disease the author recommends the destruction of affected plants as soon as observed, and instead of sowing the grain closely to plant it at sufficient intervals to secure a better aeration of the plants.

A new disease of white sweet clover, R. LAUBERT (*Arb. K. Gesundheitsamte, Biol. Abt., 3* (*1903*), *No. 4, pp. 441–443, figs. 5*).—A description is given of *Ascochyta caulicola*, n. sp., a fungus which causes considerable injury to the leaves and stems of *Melilotus alba*.

A rosette disease of potatoes, A. D. SELBY (*Ohio Sta. Bul. 139, pp. 53–66, figs. 5*).—The author describes a disease of potatoes which is attributed to the sterile fungus Rhizoctonia. This fungus causes lesions on the stems below or near the surface

of the ground and results later in a peculiar branching or clustering of the leaves. This clustering, which is possibly secondary, is so conspicuous that it affords a sufficient means for the detection of a large percentage of the affected plants.

The disease has been under observation since 1900, and from the results obtained is apparently disseminated with the seed tubers. Attention was first called to it by the widespread occurrence through seed tubers that had been sent out from the station. Subsequent investigations seemed to prove that it spread from the station as a center, and methods of prevention were investigated. Tubers were treated with a solution of formalin before planting, and in 1902 there was practically no evidence of the rosette disease in the leaves of growing plants in the rows treated with formalin. Where the seed tubers had been given a treatment with corrosive sublimate previous to planting, there was no indication of immunity from disease. This method of treatment has been continued, and based upon 2 seasons' work the conclusion is drawn that formalin treatment will prevent Rhizoctonia disease to a very marked extent.

The author calls attention to the extreme diversity in injury among several varieties of potatoes grown at the station, and states that an average of from 6 to 20 per cent loss was due to this disease. For the practical prevention of the rosette disease, soaking the seed tubers for 2 hours in a solution of formalin composed of 0.5 pt. formalin to 15 gal. water is recommended. The bulletin concludes with citations to literature regarding Rhizoctonia diseases.

Remedies for the root disease of sugar cane (*Agr. News [Barbados], 2 (1903), No. 29, p. 162*).—The writer suggests preventive measures for combating the root disease of cane. The means suggested consist of selection of resistant varieties, planting healthy canes, careful cultivation and thorough drainage, rotation of crops, and the removal of diseased plants when discovered to prevent the fungus spreading to healthy ones. The diseased areas may be isolated by digging trenches a foot to 18 in. deep about the diseased plants, care being taken that the infested soil should not be thrown toward the healthy plants. In no case should the diseased canes be allowed to rattoon. The root disease, which is due to Marasmius, is said to have caused considerable loss to the planters of the West Indies during the past season.

Pests of garden vegetables, M. C. COOKE (*Jour. Roy. Hort. Soc. [London], 27 (1903), No. 4, pp. 801–831, pls. 3, fig. 1*).—Descriptions are given of a large number of the more common fungus diseases which attack garden vegetables, and, so far as known, methods are suggested for the prevention of their attack.

A new disease of beans, A. MAIGE (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 14, p. 334*).—A brief description is given of a disease of green beans which has proved very destructive in gardens during the past season. This disease is characterized by a development on the leaves of greenish-yellow spots which, extending little by little, finally involve the entire leaf. The fungus causing this disease has not been definitely determined, but reasoning from analogy of other diseases the author believes that this disease could be held in check by the use of standard fungicides.

The parasitism and development of Sclerotium cepivorum on onions, P. VOGLINO (*Staz. Sper. Agr. Ital., 36 (1903), No. 2, pp. 89–106, pls. 2, fig. 1*).—A study was made of the cause of the almost total loss of the onion crop in parts of Italy, and the results of investigations are given. The disease has been under observation since 1897, the last serious outbreak occurring in 1901 followed by a rare occurrence in 1902. The cause of the disease is attributed to *Sclerotium cepivorum*, which develops a conidial form, that has formerly been recognized as *Sphacelia allii*, upon the dead leaves and bulbs. The biology of the fungus is described and its parasitism affirmed. During hot weather the fungus develops with great rapidity in moist rich soils, particularly in those containing a large amount of humus. The only suggested means for preventing this disease is the abandonment of onion culture in infected soils.

Notes on a disease of black salsify, R. ADERHOLD (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 4, pp. 439, 440, fig. 1*).—The author describes a disease of black

salsify which is due to the fungus *Sporidesmium scorzoneræ*, n. sp. This fungus attacks the leaves and stems of the black salsify, causing considerable injury. It is believed that it could be controlled by spraying the plants with Bordeaux mixture after its first appearance is noted.

The bitter rot of apples, H. VON SCHRENK and P. SPAULDING (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 44, pp. 54, pls. 9, figs. 9*).—A description is given of the bitter rot of apples, which is believed to have caused very serious losses to the apple crop of the United States, the loss in 1900 being estimated at $10,000,000. An account of the history, distribution, and a general description of the bitter-rot fungus is given. The fungus, the complete stage of which is known as *Glomerella rufomaculans*, is described and the relation of the cankers, which were discovered by an agent of the Department, to this disease is fully discussed. These cankers seem to be the centers from which the disease spreads in cone-like areas through the trees, and by inoculation experiments the authors have demonstrated that the conidial spores of the canker would produce the bitter rot on the apples, and cultures from diseased apples would produce the cankers on the tree branches. This fully demonstrates the relation between the cankers of the trees and the disease of the fruits.

The fungus is said to attack ripening apples during July and August, and is most virulent during moist hot summers. It is widely distributed over the eastern United States, being most active from Virginia to Oklahoma and southward. For the prevention of the disease the authors recommend the cutting out of the canker-like areas whenever discovered, and as a further precaution frequent spraying with Bordeaux mixture until the fruits are nearly ripe.

On the infection of apple trees with Fusicladium from species of Cratægus and Sorbus, R. ADERHOLD (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 4, pp. 436–439, figs. 2*).—As a result of an extended investigation the author seems to be inclined to the belief that it is possible to reciprocally inoculate certain of these organisms from one host to another.

A cherry tree disease: its cause and prevention, R. ADERHOLD (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 4, pp. 309–363, pls. 3, figs. 7*).—Since 1898 there has been noticed on the cherry trees along the Rhine River a very destructive disease that has been referred to various causes, but is now definitely determined as due to the fungus *Valsa leucostoma*. The fungus attacks the larger branches and main stems of the trees, gaining access, in part at least, through the injuries caused by late freezes. From these centers the fungus develops, causing a one-sided growth of the twig and presenting a cancer-like appearance accompanied by a copious flow of gum. By the subsequent growth and spread of the fungus the branch or stem becomes girdled, resulting in its destruction. The author discusses the history of the disease, the fungus and its parasitism, which has been definitely established by numerous inoculation experiments, and the relation of frosts to the disease, and suggests methods of control. The methods recommended include cutting and burning the dead and dying trees, cutting out infected areas where the attack is slight, and stimulating the tree growth in various ways.

The sooty mold of the olive, E. ZACHAREWICZ (*Rev. Vit., 20 (1903), No. 505, pp. 209–215; Bul. Agr. Algérie et Tunisie, 9 (1903), No. 8, pp. 179–186*).—A description is given of the sooty mold of olives which is due to the presence of the fungus *Fumago salicina* which develops over the various parts of the tree following the presence of the olive scale (*Lecanium oleæ*). In addition to the sooty mold the olive is frequently attacked at the same time by the fungus *Cycloconium oleaginum*. This fungus develops on both surfaces of the leaves, on the pedicels bearing the fruits, but rarely on the fruits themselves. To combat these diseases the author recommends the application of a combined insecticide and fungicide which is composed of soap 1 kg., petroleum 4 liters, copper sulphate 1 kg., and water 100 liters. Directions are given for the preparation of this mixture and suggestions for its application. Ordina-

rily 2 applications should be given the trees, the first about April 15 and the second about May 20. One hundred liters of this solution should not cost more than about 50 cts. and this would be enough to treat from 10 to 20 trees, depending upon their development.

Notes are given on a number of olive insects, with suggestions for their eradication and formulas for fertilizers which are recommended for use in connection with olive culture.

Cacao canker and its eradication (*Trop. Agr., 23* (*1903*), *No. 1, p. 31*).—Attention is called to the cacao canker in Ceylon and recommendations made for its eradication. The canker is said to have increased, and for its further eradication the author suggests that some legislation should be provided to protect private property from injury through the neglect of those who do not attempt to combat the disease. The disease may be prevented to a considerable extent by pruning and thinning out the shade so as to secure a better circulation of air through the trees, and by cutting out and burning all the dead trees and branches together with all the diseased areas shown on otherwise healthy trees. By concerted action of this kind it is believed that the disease can be almost entirely eradicated.

Black rot and its treatment, A. PRUNET (*Rev. Vit., 19* (*1903*), *No. 494, pp. 641–645; 20* (*1903*), *No. 498, pp. 14–19*).—A résumé is given of the author's investigations on the development and treatment of the black rot, the number, duration, and interval of the different invasions of the fungus being shown and the period of incubation being described. For the prevention of the disease the author recommends thorough spraying with Bordeaux mixture.

Treatment of black rot of grapes, A. PRUNET (*Rev. Vit., 20* (*1903*), *No. 499, pp. 39–42*).—According to the author, fungicides containing an equal amount of copper in solution have equal efficiency without reference to their acid or neutral reaction. When the cost of application is to be considered Bordeaux mixture, composed of 2 kg. of copper sulphate to 1 kg. of lime in a hectoliter of water is recommended. In spraying, all portions of the vines and leaves should be well covered with the fungicide and repeated applications should be made as conditions require.

This application, while it has some effect on the powdery mildew, does not entirely prevent it, and it is recommended that a special application of sulphur should be given during July as supplemental to the other treatments.

Black rot and grape mildew, J. CAPUS (*Rev. Vit., 20* (*1903*), *No. 500, pp. 70–74*).—An account is given of observations on the occurrence and treatment of black rot and downy mildew of grapes during 1902. The dates are given upon which the different diseases appeared, there having been 5 distinct attacks of each fungus. The period elapsing between the successive appearances of the 2 fungi was approximately the same, the exact period varying according to the atmospheric or other conditions. Suggestions are given for combating these diseases, spraying with Bordeaux mixture being recommended for both the black rot and the Plasmopara.

Notes on grape mildew, L. RAVAZ (*Prog. Agr. et Vit.* (*Éd. L'Est*), *24* (*1903*), *Nos. 21, pp. 629, 630; 22, pp. 658–660, pls. 2*).—Notes are given on the appearance of the downy mildew (*Plasmopara viticola*) and its effect upon the grapevine. The first attack of mildew is said to be rather insignificant, followed by more destructive attacks. The subsequent occurrence of the fungus may be controlled to a large extent by the thorough application of copper fungicides.

Grape mildew, J. DUFOUR (*Chron. Agr. Canton Vaud, 16* (*1903*), *Nos. 9, pp. 234–247; 10, pp. 274–280*).—A description is given of the mildew of grape due to *Plasmopara viticola*, and an account of the very destructive outbreak of this disease during 1902. Brief reports are given from a large number of grape growers on the occurrence and characteristics of the disease and upon the various means adopted to prevent the spread of the fungus. The different fungicides used are described and their formulas and directions for application given.

Grape mildew, J. Dufour (*Chron. Agr. Canton Vaud, 16 (1903), No. 17, p. 485*).—The author notes an unusual prevalence of grape mildew in many localities, and states that various treatments which have been recommended have given very unequal results. In order to study the question more fully a circular has been widely distributed from the experiment station at Lausanne asking for reports on the results of different methods of treatment. It is hoped from the data thus collected that some positive recommendation can be made for combating this disease.

Treatment of gray rot, E. Combemale (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 31, pp. 138–140*).—The author claims to have successfully used against *Botrytis cinerea* a mixture of triturated sulphur 50 kg., powdered quicklime 25 kg., and sulpho-steatite 25 kg. By the use of this mixture a considerable saving is effected over the ordinary use of triturated sulphur. The author uses this powder alone or as supplementing treatments of Bordeau mixture, in which case he has given 2 or 3 applications of the powder to 3 or 4 of the Bordeau mixture.

Treatment of gray rot of grapes, E. Zacharewicz (*Prog. Agr. et Vit. (Éd. L'Est), 24, (1903), No. 32, pp. 167, 168.*)—A description is given of a method of treatment of grapes for the prevention of attacks of *Botrytis cinerea* which has been successfully used by the author for a number of years. This consists of thorough application immediately after the first evidence of the disease of a powdered fungicide which consists of a mixture of gypsum 55 kg., powdered soap 5 kg., and sulpho-steatite containing 20 per cent copper sulphate 40 kg.

Combating grape chlorosis, G. Mottareale (*Bol. R. Scuola Superiore Agr. Portici, 2. ser., 1902, No. 6, pp. 3*).—An account is given of grape chlorosis, which is particularly destructive to the American stock used in Europe as a means of preventing phylloxera. The author summarizes the resistance of different stocks to chlorosis, and for the prevention of the disease he suggests treatment early in the spring by washing the vines with a 10 to 15 per cent solution of iron sulphate, by spraying the vines later in the season with a 0.5 to 1 per cent solution of iron sulphate, or by a third method, which is considered perhaps the most efficient, washing the vines after the fall of the leaves in autumn with a strong solution of iron sulphate to which is added 40 per cent sulphuric acid. If the treatment is neglected until later in the season it may be given the vines in January or a little later, but in this case the amount of sulphuric acid should be reduced to not more than 25 per cent.

The effect of sulphuric acid in retarding the growth of vines, J. D. Catta (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 12, pp. 356–358*).—Attention is called to the use of weak solutions of sulphuric acid as a winter wash for grape vines to prevent attacks of anthracnose. This has been recommended for a number of years, and dilute sulphuric acid, without the addition of iron sulphate, is extensively used in Algeria. It is shown that it exercises an important effect in retarding the early development of buds on the vines, and thus protects them from late spring frosts. The author has used solutions of sulphuric acid containing from 10 to 12 per cent of the acid upon grapevines, with the result that they were retarded in their development about 15 days. Where a weaker solution was used the vegetation was arrested 7 or 8 days.

A disease of clematis, F. Morel (*Rev. Hort. [Paris], 75 (1903), No. 15, pp. 364, 365*).—A description is given of a disease of clematis which has been variously attributed to improper cultivation, nematodes, fungi, etc. The author is convinced that it is of bacterial origin. The first indication of the presence of the disease may be noticed in the small openings which form in the stems, and these seem to spread with the increased humidity and temperature. Later a ring a few millimeters across is formed about the stem, when the plant dies beyond this infested region, while below it it does not seem to be injured. On account of the definite formation of these zones about the stem near the ground, the author does not believe that the disease is due to the nematodes, but that it is caused by bacteria which find entrance into

the stem. So far as the author's observations go, there does not appear to be any successful method of combating this disease.

A disease of tulips, caused by Botrytis parasitica, J. RITZEMA BOS and G. STAES (*Tijdschr. Plantenziekten, 8 (1902), pp. 177–202*).—The author describes the characteristics of a serious disease that causes annually a loss of from 5 to 30 per cent of the bulbs in some of the bulb-growing districts.

Tulips are most liable to be attacked by this disease, but hyacinths and Spanish iris also suffer. The disease does the greatest damage by attacking and destroying the flower bud before it has pushed through the ground; afterwards the decay extends to the entire old bulb and sometimes involves the new young bulb. The fungus also attacks the flower stalk and leaf, causing spots on the leaf and causing the blossom to fall over. The infection is spread by the cultivation of the ground, and also by the sclerotia being blown from one field to another with the sand during dry weather. Besides this soil infection there is an infection through the air by means of conidia. These give rise to the leaf spotting and to the diseased condition of the flower stalk resulting in its fall.

A number of methods for combating this disease were tried, but none proved both effective and practical except the use of creolin and carbolineum, and the latter being the cheaper was used for the field tests. The application of 50 liters of carbolineum per "are" (100 sq. meters) in the late summer destroyed all plant life. Bulbs could not be planted and even the following summer no weeds grew. The following autumn, however, tulip bulbs were planted, and of these not more than 2 per cent became diseased, and in some cases the disease was entirely absent, while in adjacent check beds 8 to 15 per cent of the bulbs was diseased. A more uniform distribution of the carbolineum was secured by mixing it with sand before applying.

Further tests are being made to determine the most efficient and economical methods of application of the carbolineum.—H. M. PIETERS.

Powdered fungicides, J. DUFOUR (*Chron. Agr. Canton Vaud, 16 (1903), No. 13, pp. 388–390*).—On account of the widely recommended use of fungicides in powdered form, the author has made a study of the different fungicides recommended, and he divides them into 2 classes—those composed of sulphur and sulphate of copper, and those composed of powdered sulphate of copper and some base, such as talc or steatite. Each of these forms has its advocates, and their relative efficiency is not commented upon. The formulas for the preparation of a number of the more common powdered fungicides are given.

Notes on the powdered sulphate of copper, J. DE GIRARD (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 26, pp. 773, 774*).—Attention is called to the recent recommendations of the use of powdered copper sulphate in combating the downy mildew of grapes and of its combination with sulphur against the powdery mildew. The author claims that powdered fungicides are less efficient than liquid ones, are more liable to injure foliage through their acidity, and are less adhesive and more troublesome to apply. To avoid the corrosive effect of the copper sulphate, talc is frequently used, the mixture being called copper steatite or sulpho-steatite. When pure magnesium silicate is used, the mixture will be found to contain a fairly constant amount of copper sulphate, but as much of the talc contains calcium carbonate the copper undergoes a change by oxidization and instead of 10 per cent copper sulphate, as claimed in some samples tested, the actual amount found to be present as sulphate was 0.78 per cent and the reaction was but very slightly acid. On the other hand, a sample said to contain 8 per cent copper sulphate when examined showed 5 per cent free sulphate and was very acid. This difference is said to account for the widely divergent results frequently obtained where these fungicides are used.

Sulphur and copper fungicides, J. M. GUILLON (*Rev. Vit., 19 (1903), Nos. 494, pp. 651–655; 495, pp. 681–684; 496, pp. 704, 705; 20 (1903), No. 498, pp. 9–14, figs. 5*).—Studies are reported upon the physical and chemical characteristics of a number of

fungicides which are grouped by the author into 4 classes—sulphur fungicides, liquid copper fungicides, powdered copper and sulphur, and liquid copper and sulphur mixtures. In all of these the fineness of the particles and thoroughness of application have a most important bearing upon their efficiency. In the case of the different forms of sulphur used the precipitated sulphur is preferred to the sublimed or triturated form, on account of its much greater fineness. Attention is called to some of the changes which take place in liquid fungicides when made up and allowed to stand for a considerable time. It is said to be sometimes necessary to apply a dressing of powdered sulphur between the sprayings with liquid fungicides to ward off severe attacks of the powdery mildew.

Some of the newer fungicides, B. D. Halsted and J. A. Kelsey (*New Jersey Stas. Bul. 167, pp. 15, pls. 2*).—The authors review different formulas for the preparation of Bordeaux mixture and give particular attention to the preparation and use of soda-Bordeaux. The use of this fungicide has been described in previous reports of the station, and in the present bulletin the authors recommend the following formula for its preparation: Soda (Lewis's Lye) 1 "pound" can, copper sulphate 3 lbs., lime 5 oz., and water 30 gal. This preparation has been successfully used not only in New Jersey, but elsewhere, and has the advantage of being equally as efficient as Bordeaux mixture made by the usual formula, but without the objectionable mechanical features of the ordinary Bordeaux mixture.

Attention is called to the use of formalin as a fungicide for disinfecting seed grain and for the prevention of potato scab, and notes are given on kerosene emulsion as a fungicide. A preliminary report on the use of kerosene emulsion in this way was given in the report of the station (E. S. R., 15, p. 579). These investigations have been continued, and it has been found that for the prevention of mildew on ornamental shrubs it is a very efficient treatment.

ENTOMOLOGY.

The elements of insect anatomy, J. H. Comstock and V. L. Kellogg (*Ithaca: Comstock Pub. Co., 1902, 4. ed. rev., pp. 145, figs. 11*).—In this volume the authors have outlined a course of study in the gross and microscopic anatomy of insects. The following topics discussed in the volume may be especially mentioned—external anatomy of locusts, internal anatomy of *Corydalis cornuta*, anatomy of the larvæ of the crane flies, external anatomy of beetles, mouth parts of insects, venation of the wings, and methods of insect histology.

Notes on economic entomology, F. V. Theobald (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 50–85, pls. 2*).—The author discusses the subject of injurious flea-beetles and their eradication. Notes are given on the damage caused by these insects, the method of invasion of beetles, and the effects of weather upon them. The more important genera of flea-beetles are briefly characterized and detailed notes are given on a number of specially injurious species, including *Haltica oleracea, Phyllotreta nemorum, P. undulata, P. crucifera, P. consobrina, P. atra, Crepidodera rufipes, C. aurata*, etc. The habits, life history, and means of combating sheep botfly are briefly discussed. The author recommends that tar should be smeared over the receptacles in which salt is kept, so that the sheep will come in contact with the tar in securing the salt. The tar serves as a deterrent to the sheep botfly. The author describes in considerable detail the life history of *Pemphigus spirothecæ*, which is reported as injurious to poplars. An article on the migration of the hop aphis, written by Plomley in 1849, is reproduced.

Injurious insects, E. Fleutiaux (*Agr. Prat. Pays Chauds, 3 (1903), No. 12, pp. 745–760*).—Notes on a weevil (*Sphenophorus sordidus*) injurious to the trunks of bananas; an enemy of beeswax (*Achroia grisella*); a species of grasshopper injurious to coffee; bean weevils; beetles injurious to mulberries, coffee, and other trees.

Royal Station of Agricultural Entomology of Florence, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1 ser., 1903, No. 6, pp. XXXVI+354, pls. 9, figs. 85*).—In this number of the report of the Royal Entomological Station the author presents a series of articles dealing with various injurious insects. A number of these articles may be briefly mentioned in this connection.

Notes are given on the gnats of the olive, with particular reference to *Clinodiplosis oleisuga*. The anatomy of these insects is described, together with an account of the development of various species. For combating these insects the author recommends that the infested bark be scraped off and burned. Some of the more important species of scale insects affecting the olive are discussed, including biological, descriptive, and economic notes on species of Pollinia, Philippia, and Lecanium. The conditions which are favorable or unfavorable to the distribution of these insects are described, together with insecticide experiments from 1896 to 1901. Good results were obtained by the use of a spray containing soap, oil of tar, and water. The cost and effectiveness of the insecticide methods are discussed by C. Campbell and G. Patriarca. Notes are given on the Diaspini of the olive, including a brief discussion of the anatomy and developmental stages of various species of Howardia, Leucaspis, etc. A description is given of peculiar alterations in the branches of pears and of a leaf miner in the branches of olives attacked with knot (pp. 116–125). A lepidopterous larva was found in knots caused by *Bacillus oleæ*, and another species of moth was found to cause peculiar wart-like enlargements on the branches of pear trees. A peculiar alteration of the branches of olives due to a species of thrips is noted.

Experiments were made to determine the action of calcium oxid on the larvæ and eggs of the cabbage butterfly. It was found that calcium oxid did not injure the larvæ of cabbage butterfly if they had been previously moistened with water. Small larvæ were quickly destroyed as a result of the process of dehydration when subjected to the action of this chemical. Oxid of lime was much less effective upon the eggs than upon the larvæ.

Notes are presented on a diseased condition of the grapevine and hazelnut and on experiments in combating it. The hazelnut is attacked by nematode worms, species of fungi, and mites. The buds, leaves, and flowers are subject to the attack of lepidoptera and various other insects. In destroying nematodes, mites, and insects upon the roots of the hazelnut, good results were obtained in the use of carbon bisulphid, alone or combined with a treatment with soluble wood tar. Arsenical poisons are recommended for the destruction of leaf-eating insects upon the hazelnut and grapevine. The anatomical details of the males of *Ceroplastes sinensis* are described.

Experiments were made to determine a method of protecting pear and apple trees against the attacks of apple maggot, scale insects, and lichens. The purpose of these experiments was to find a spray which would prove effective against all these enemies at once. The best results were had with the use of a mixture containing heavy oil of tar, soda, and water.

Brief notes are also given on a gall on rose stems, caused by an undetermined beetle; the protection of plantations of poplar and willow against the attacks of *Cossus cossus*, and *C. ligniperda;* on the common rose aphis *Siphonophera rosæ;* the destruction of grasshoppers in Argentina; galls on *Solanum sodomæum;* Thysonoptera injurious to grain fields in Italy; black peach aphis and experiments in combating it; various known and new species of plant lice imported into Italy; anatomical notes on Italian species of Phylloxera, and a general account of insects injurious to cereals in growing and stored condition.

The first annual report of the State nursery inspector, H. T. FERNALD (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 287–293*).—A copy is given of the nursery inspection law of Massachusetts, together with a brief report on the work of inspection for the first year. During this period 80 nurseries were inspected, and of

this number 57 were found to be infested to some extent by injurious insects or diseases. The insect and fungus pests which are considered most important in Massachusetts are gypsy moth, brown-tail moth, San José scale, West Indian peach scale, peach yellows, pear blight, and black knot. As a rule infested stock was destroyed, and little use has thus far been made of the alternative of fumigating such stock rather than destroying it.

Report of the committee on gypsy moth, insects, and birds, A. PRATT ET AL. (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 265–271, pl. 1*).—A brief account is given of the present status and distribution of the gypsy moth, together with a discussion of the depredations committed by the moth and the prospects of future damage from this insect. During the past year a number of the large colonies have defoliated considerable areas of trees and caused alarm in a number of localities.

Report on the work of the State entomologist for 1902, S. LAMPA (*Meddel. K. Landtbr. Styr. [Sweden], 1903, No. 85, pp. 60, fig. 1*).—Notes are presented on the insect outbreaks during the year throughout various parts of Sweden as reported by various observers and correspondents. Upon the whole, the insect outbreaks during the year were less pronounced than during the preceding year. Considerable injury was done to apple trees by *Cheimatobia brumata* and *Hibernia defoliaria*. A brief account is presented of the injuries caused to cereals by cockchafers, wireworms, and frit fly. Notes are also given on pea weevil and a number of miscellaneous insects injurious to garden vegetables and fruit trees.

Notes and practical suggestions relative to combating animals injurious to cultivated plants, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1903, No. 5, pp. 208, pls. 7, figs. 88*).—Descriptive, economic, and biological notes are presented on the more injurious insects of Italy, belonging to the following groups: Thysanoptera, Thrips, and Lepidoptera. The more important species are described in detail and notes are given on their habits, life history, food plants, natural enemies, and artificial remedies. The majority of the species considered are illustrated.

Injurious insects and other animals observed in Ireland during the year 1902, G. H. CARPENTER (*Econ. Proc. Roy. Dublin Soc., 1 (1903), IV, No. 9, pp. 195–218, pls. 2, figs. 7*).—Economic and biological notes are given on *Hepialus humuli*, crane flies, wheat-bulb fly, carrot fly, turnip fly, rose sawfly, Mediterranean flour moth, *Anobium domesticum*, *A. paniceum*, *Oniscus asellus*, *Syagrius intrudens*, etc.

The Hessian fly in Ohio, C. E. THORNE (*Ohio Sta. Bul. 136, pp. 24, pls. 2, figs. 10*).—During the past season the damage from Hessian fly is said to have exceeded that of any previous attack of this insect. Detailed notes are given on the previous important outbreaks of Hessian fly in Ohio. From a consideration of these outbreaks it appears that a warm autumn is favorable to the prevalence of the fly, but that the rainfall has little effect upon its relative abundance. In general the climatic conditions which favor the growth of wheat also favor the increase of the Hessian fly. In a few instances continuous October frosts appeared to check the development of the Hessian fly. The liberal use of manure or fertilizers assisted in some instances in saving wheat from total destruction. According to statistics extending over a long period of years it appears that it is not safe to sow wheat earlier than from September 23 to October 10, according to the latitude of different parts of the State. It is stated, however, that while it is possible to avoid injury from the Hessian fly by late seeding, "in average seasons the risk of winter injury to wheat sown sufficiently late to avoid the fly appears to be quite as great as the risk from the fly." It is recommended that a part of the crop be sown moderately early in order to determine whether the Hessian fly prevails to an unusual extent during any particular season, or that several sowings be made a few days apart in order to induce the insects to make their main attack upon the earlier sowing.

Hessian fly in Missouri, J. M. STEDMAN (*Missouri Sta. Bul. 62, pp. 131–149, figs. 6*).—The Hessian fly is found throughout Missouri and is considered to be second only to

the chinch bug in the destruction of wheat. Notes are given on the habits, life history, and food plants of this insect. In controlling the pest the author recommends late sowing of fall wheat and the burning or plowing under of all infested stubble.

The eggs of insects which are frequently found on sugar cane, W. VAN DEVENTER (*Meded. Proefstat. Suikerriet West Java, 1903, No. 63, pp. 10, pls. 2*).—Descriptive, economic, and biological notes on a number of insects injurious to sugar cane, including *Euproctis minor*, *Procodeca adara*, *Chilo infuscatellus*, and *Diatræa striatalis*.

Enemies of tobacco, G. D'UTRA (*Bol. Agr. São Paulo, 4. ser., 1903, No. 3, pp. 111–122, figs. 3*).—Notes are given on the habits, life history, and means of combating *Protoparce carolina*, *Epitrix parvula*, *Dicyphus minimus*, and other less important insects.

Insect enemies of stored grain, POSKIN (*Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 4, pp. 532–557*).—The author presents descriptive, biological, and economic notes on granary weevil, Angoumois grain moth, and a number of other insects injurious to stored grain, together with a detailed discussion of the artificial remedies which are usually recommended in combating these insects. These remedies include mechanical shock and the application of heat, cold, and poisonous gases.

Insects that damage wheat and other food stuffs, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14* (*1903*), *No. 6, pp. 481–492, pl. 1*).—Notes on the habits, life history, and means of combating rice weevil, granary weevil, flour beetle, saw-toothed grain weevil, bean weevil, Mediterranean flour moth, Angoumois grain moth, etc.

The pests and blights of the tea plant, G. WATT and H. H. MANN (*Calcutta: Supt. Govt. Printing, 1903, 2. ed., pp. XV+429, pls. 24, figs. 44*).—This handbook on the insect and fungus pests of the tea plant has been largely rewritten in the present edition. The purpose of the volume is to present a general account of cultural methods adapted to preventing the attacks of insects and fungus enemies, and to furnish biological and economic accounts of the chief pests of tea. As stated by the authors, the purpose of the cultural suggestions made by them is to furnish data regarding methods which "should necessarily accompany more specific efforts to battle with the pests and blights." About one-third of the volume is occupied with cultural details, while the remaining two-thirds is devoted to a discussion of insects and fungus enemies. The insects are classified into natural orders and discussed in a systematic manner. The majority of the species are well illustrated. Among the numerous species which are discussed mention may be made of a few of the more important ones, including *Lachnosterna impressa*, *Diapromorpha melanopus*, *Amatissa consorta*, *Brachytrypes achatinus*, *Helopeltis theivora*, *Chlorita flavescens*, *Ceylonia theæcola*, *Termes taprobanes*, and *Tetranychus bioculatus*. A number of fungus diseases of tea is considered (pp. 392–416). The more important of these are due to the following species: *Stilbum nanum*, *Cephaleuros mycoidea*, and *Nectria ditissima*.

White fly (Aleurodes citri), H. A. GOSSARD (*Florida Sta. Bul. 67, pp. 595–666, pls. 6, figs. 3*).—A general account is given on the family Aleurodidæ, with special reference to the white fly. The original home of this insect is not definitely known, but it is believed to be Florida. It is also found in Louisiana, Georgia, North Carolina, Texas, and the District of Columbia. The insect is described in detail in its various stages. It is considered to be the worst orange pest of Florida, and is known to be established in 14 counties of that State. There are 3 broods, which occur from March to May, June to August, and September to November, respectively. The eggs are deposited upon the leaves. The insect is distributed greatly by nursery shipments, wind currents, and various vehicles. The chief natural enemies of the insect are brown fungus, *Aschersonia aleurodis*, and other species of parasitic fungi as well as ladybirds. In experiments to discover the effect of cold storage the white fly was killed by subjection to temperatures of 10 to 20° F. for periods varying from 1 to 48 hours. Notes are given on the food plants of this insect. Among the insecticides discussed by the author mention should be made of resin sprays, kerosene

emulsion, whale-oil soap, Montgomery's insecticide, tobacco decoction, sulphur dust, and hydrocyanic-acid gas. The most favorable time for spraying is during the winter period; at least 2 thorough applications should be made. Fumigation with hydrocyanic-acid gas proved effective, but is not generally recommended. Resin wash is considered to be a very satisfactory spray and potash whale-oil soap may also be used with good success and with little injury to the trees.

The white fly, H. A. GOSSARD (*Florida Sta. Farmers' Inst. Bul. 1, pp. 29–50*).—The white fly is described in its various stages and notes are given on its habits and life history. A number of remedies have been tried in combating this insect, and good results are reported from the use of resin wash and other similar insecticides. A parasitic fungus is believed to help appreciably in the destruction of this insect.

Fiddler beetle (*Jour. Jamaica Agr. Soc., 7 (1903), No. 7, pp. 275–277*).—The roots of orange trees are said to be greatly injured by a beetle which was identified as *Exophthalmus vittatus*. The beetle is most injurious in its larval condition. The adult beetles may be jarred from the orange trees in the early morning and captured.

An enemy of olive grafts, TRABUT (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 13, pp. 308, 309, fig. 1*).—Considerable injury to the grafts of olives is reported as due to the attacks of *Otiorhynchus crebricollis*. The young grafts may be protected by spraying with arsenical insecticides.

Lecanium oleæ, TRABUT (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 11, pp. 258, 259*).—This insect is considered one of the worst pests of the olive. Since certain of the enemies of the olive scale live on fig trees, it is recommended that the latter trees be planted in the vicinity of olive groves.

A new destructive scale insect, TRABUT (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 13, pp. 289, 290, fig. 1*).—Notes are given on *Ceroplastes sinensis*, which is considered one of the most important enemies of the orange in Algeria.

The San José scale: its native home and natural enemy, C. L. MARLATT (*U. S. Dept Agr. Yearbook 1902, pp. 155–174, pls. 6, figs. 3*).—A discussion of the history, distribution, natural enemies, and home of the San José scale. As a result of the author's travels in the Orient it is believed that China is the original habitat of this insect. Considerable assistance may reasonably be expected from *Chilocorus similis* in the destruction of the scale. This ladybird was introduced from China and has been distributed in a number of localities in the United States.

A catalogue of the Coccidæ of the world, MARIA E. FERNALD (*Massachusetts Sta. Bul. 88, pp. 360*).—The number of species of Coccidæ recognized in this bulletin is about 1,500. The preferred specific name is given in each case, followed by full bibliographic references and synonyms. A detailed index contains the names of subfamilies, genera, subgenera, species, and subspecies. This index enables the entomologist to make rapid references to the names and synonymy to the various species as contained in the text of the bulletin.

Some wood-boring beetles and their habits, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14 (1903), No. 5, pp. 414–417, pl. 1*).—Descriptive, biological, and economic notes on *Bostrychus cylindricus*, *Xyleborus solidus*, *Lyctus brunneus*, and *Gracilia pygmæa*. Xyleborus was reported as causing considerable injury to apple and peach trees. The apple trees were most affected. In some cases limbs 1 in. in diameter were so badly eaten that they readily broke off.

Some of the principal insect enemies of coniferous forests in the United States, A. D. HOPKINS (*U. S. Dept. Agr. Yearbook 1902, pp. 265–282, pls. 2, figs. 10*).—An account is presented of the habits, life history, and means of combating *Dendroctonus piceaperda*, *D. frontalis*, *D. ponderosa*, and other injurious species of this genus. The author briefly indicates the remedies which may be employed in checking the spread of these insects.

The narcissus or daffodil fly, W. WILKS (*Jour. Roy. Hort. Soc. [London], 27 (1902), No. 1, pp. 181–185, fig. 1*).—A study was made of the life habits and history of

Merodon equestris, which is reported as greatly injurious to daffodils. According to the observations of the author, the eggs are deposited in the scales near the top of the bulb, and the larva after hatching eats its way down through the bulb and finally emerges at the base. No practical remedies for this pest have been discovered.

Locust destruction, W. H. Bushby (*Agr. Jour. and Min. Rec.* [*Natal*], *6* (*1903*), *No. 13, pp. 457–464*).—This is the report of the chief locust officer for the Natal government and contains a report of the operations conducted by the government in the destruction of these insects. The formula for the insecticide which was successfully used in various parts of Natal is as follows: 1 lb. arsenic, 0.5 lb. soda, 0.8 lb. sugar, 16 gal. water. The solution was found to be quite harmless to stock except when considerable quantities were taken at one time. The country was divided into districts for the purpose of securing a more effective extermination of the locusts, and each district was placed in charge of a local officer who was made responsible for the destruction of the young locusts. Calls for aid from natives in locust-infested districts were not always met enthusiastically and the author complains that in many instances too much was expected from the government operations along this line.

The invasion of locusts in Charente, J. Ricard (*Ann. Inst. Nat. Agron., 2. ser., 2* (*1903*), *No. 1, pp. 145–179, figs. 6*).—The species of locust which is reported as having caused most damage in Charente is *Caloptenus italicus*. Notes are given on the distribution of the insect and the depredations committed in 1901 and 1902. Little success was had from the use of ordinary chemical remedies in combating this insect, and the author believes that the main reliance must be placed upon the proper use of mechanical remedies, such as large hopperdozers combined with the employment of a considerable force of men armed with small branches of trees to be used in driving the young locusts. Among the natural enemies of locusts the author mentions parasitic fungi and unfavorable climatic conditions.

Cicadas and their habits, W. W. Froggatt (*Agr. Gaz. New South Wales, 14* (*1903*), *No. 5, pp. 418–425, pls. 2*).—Notes are given on the following species of Cicada: *Tibicina curvicosta, Macrouistria angularis, Psaltoda flavescens, Melampsalta melanopygia, M. encaustica, Tettigarcta tomentosa, Cystosoma saundersii,* and *C. vitripennis*. A bibliography of the subject is appended to the article.

Spraying crops, C. M. Weed (*New York: Orange Judd Co., 1903, 4. ed., pp. 136, pls. 5, figs. 53*).—In this edition an attempt has been made to bring the discussion of insecticides and fungicides up to date by inclusion of some of the newer formulas which have been recommended by entomologists and botanists.

Insecticide studies, J. K. Haywood (*U. S. Dept. Agr., Bureau of Chemistry Bul. 76, pp. 63*).—An investigation was made of pyrethrum powders containing poisonous metals. It was found that in some localities the public demands that pyrethrum powders be bright yellow. This color is produced by the addition of lead chromate. Since this chemical is poisonous to man, attention is called to the dangers from using pyrethrum powders containing lead chromate, and a number of cases of poisoning are reported from the literature on the subject. During this investigation 105 samples were analyzed, and 18 per cent were found to be colored by lead chromate. It is believed that where pyrethrum powders are sprinkled about houses for the destruction of fleas, cockroaches, and other household pests the pulverized lead chromate might produce serious cases of poisoning by inhalation.

A compilation of analyses of insecticides and fungicides was made from the publications of agricultural experiment stations and is presented in a tabular form, with comments on the methods used and on the results obtained. Copies are given of the State laws governing the composition and sale of insecticides.

Paris green, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 88, pp. 11*).—A tabulated statement is presented describing 169 samples of Paris green which were submitted for analysis, and showing the amount of arsenious acid, cupric oxid, and other constituents of the various samples. From these analyses it

appears that improvement has been made during recent years in Canada in the quality of Paris green sold on the market.

The fauna of British India, Hymenoptera, C. T. BINGHAM (*London: Taylor & Francis, 1903, vol. 2, pp. 506, pl. 1, figs. 161*).—In this volume the author presents an account of the ants and cuckoo wasps. The anatomy of these insects is described in detail, and brief notes are given on their food plants and distribution.

The destruction of ants by calcium carbid, DEFONTAINE (*Agr. Prat. Pays Chauds, 2 (1903), No. 12, pp. 742–744*).—Three species of ants (*Atta sexdens*, *Camponotus rufipes*, and *Dinoponera grandis*) were found to be injurious to cassava in certain plantations in South America. For the destruction of these ants the author recommends the use of calcium carbid for the purpose of producing acetylene gas in the burrows of the ant colonies. The gas is then ignited and the ants are destroyed by the rapid combustion and explosion of the gas.

Destruction of white ants by means of sulphurous acid, P. LESNE (*Jour. Agr. Prat., n. ser., 6 (1903), No. 30, pp. 116, 117*).—An apparatus devised for the production of sulphurous acid in combating various insect pests is briefly described. As a result of his observations and experiments the author believes that this remedy furnishes an excellent means of destroying ants, white ants, and other underground insects.

Foul brood and ants, DELÉPINE (*Jour. Agr. Prat., n. ser., 5 (1903), No. 22, pp. 691, 692*).—The author advises against the use of salicylic acid as a remedy for foul brood. This remedy is not readily soluble in honey and exercises injurious effects upon the bees. The remedy recommended by the author consists in the use of naphthaline, which is hung in small sacks in various parts of the hives.

In localities where ants prove to be a nuisance to bee raisers, from their habit of crawling into the hives, the author recommends that hives be surrounded with troughs of water for a limited period, so that the ants are unable to reach the entrance to the hives and finally go elsewhere for their food.

The A B C of bee culture, A. I. and E. R. ROOT (*Medina, Ohio: A. I. Root Co., 1903, pp. 482, pls. 34, figs. 397*).—A revised edition of this cyclopedia of bee culture, including a discussion of recent experimental work in the management of bees, the treatment of honey, together with a discussion of the diseases and enemies of bees, etc.

The book of the honeybee, C. HARRISON (*London and New York: John Lane, 1903, pp. 132, pls. 13, figs. 29*).—The author presents an account of the arrangement of the apiary, bee pasturage, appliances and apparatus in use in bee raising, the practical operations involved in caring for bees and honey, and also an account of the diseases and enemies of bees. The volume is well illustrated from photographs by J. C. Douglas, and contains such information as is required by the practical bee raiser.

Apiculture (*Jour. Jamaica Agr. Soc., 7 (1903), No. 5, pp. 184–187*).—A brief discussion of the production and composition of beeswax, together with notes on the adulteration and importation of this substance. On account of the abundance and cheapness of Muscovado sugar in the West Indies it is suggested that this material might profitably be fed to bees throughout the season for the purpose of furnishing them material with which to make wax.

Modern apiculture, A. REINHOLD (*Apicultura Moderna. Buenos Aires: Author, 1903, pp. 56, figs. 142*).—A description of the beehives commonly used in North America, together with other apparatus necessary for the successful management of bees.

The breeds of mulberry silkworm and their selection, D. ROWSINSKI (*Selsk. Khoz. i Lyesov., 209 (1903), May, pp. 375–413*).—Notes are presented on the various races of mulberry silkworms as raised in various countries and the comparative merits of the different races for different purposes are shown in tabular form. The general subject of silkworm culture is also discussed.

Silk culture in France, J. C. COVERT (*U. S. Consular Rpts., 72 (1903), No. 273,*

pp. 237–239).—The author presents a detailed account of the extent of mulberry culture in France and the methods employed in this industry. Mulberries are planted either in orchards, with or without other crops between the trees, or in hedges. It has been found important to pick the leaves in a dry condition, since they keep longer than when picked wet, especially if prevented from being folded in handling.

Silk culture in Greece, D. E. McGinley (*U. S. Consular Rpts., 72* (*1903*), *No. 273, pp. 239, 240*).—In Greece silkworms are not given any other food than mulberry leaves. Mulberry trees are transplanted from January to March, and the maximum age of mulberry trees varies from 50 to 70 years. The silkworm eggs used in Greece are largely imported from foreign countries.

Silk culture in Syria, G. B. Ravndal (*U. S. Consular Rpts., 72* (*1903*), *No. 273, pp. 165, 166*).—Silk raising is reported as in a less prosperous condition than in former years. Notes are given on the culture of the mulberry in Syria and on the utensils and methods used in the production of silk.

FOODS—NUTRITION.

Dietary studies in Boston and Springfield, Mass., Philadelphia, Pa., and Chicago, Ill. (*U. S. Dept. Agr., Office of Experiment Stations Bul. 129, pp. 103*).—Dietary studies carried on in a number of American cities are reported in this bulletin, which was edited by R. D. Milner.

Dietary studies at the Boston School of Housekeeping, 1901–2, Lydia Southard (pp. 7–26).—The first of the 4 dietary studies was made under the usual living conditions, to determine the cost and nutritive value of the diet ordinarily eaten and to compare with this dietaries of medium, low, and high cost, menus being planned beforehand. The general purpose was to learn something of the factors which influence the cost of food, the relation between cost and an attractive menu, and the possibility of applying practically the results of nutrition investigations. The range in cost, nutrients, and energy in the different dietaries is shown by the following summary:

Summary of results of dietary studies at Boston School of Housekeeping.

	Cost.	Protein.	Fat.	Carbohydrates.	Energy.
	Cents.	*Grams.*	*Grams.*	*Grams.*	*Calories.*
Usual diet	28.1	93	156	349	3,156
Diet of medium cost	23.1	94	131	289	2,700
Diet of low cost	16.3	79	94	257	2,183
Diet of high cost	51.1	118	115	390	3,057

The diet in every case was adequate, but the more expensive menu was the one generally relished.

"The results of the investigation as a whole show plainly the impossibility of providing a universally satisfactory bill of fare, as long as the attitude of people toward their food is so largely a question of personal whim. They do show, however, that it is possible to provide a diet of a definite cost which may vary within rather wide limits and which shall at the same time supply the protein and energy called for by the commonly accepted dietary standards."

A dietary study at the Boston School of Housekeeping, 1901, Susannah Usher and Bertha M. Terrill (pp. 27–30).—For instruction in the practical application of dietary studies a class in the Boston School of Housekeeping planned their dietary for one week, the attempt being made to supply an adequate diet costing not over 25 cents per person per day. The menu provided, which was fairly satisfactory, cost 22.6 cents and furnished 94 gm. protein, 127 gm. fat, 317 gm. carbohydrates, and 2,776 calories per woman per day. From this, according to the authors, it seems fair

to say that the cost of the daily fare may be often diminished by intelligent planning of the menu in such a way that a reasonable proportion of moderate-priced foods is used and other justifiable economies are practiced without making the diet so plain that it is unattractive.

Dietary study at the Bible Normal College, 1902, Bertha M. Terrill (pp. 31-36).—The students of the Bible Normal College, situated then at Springfield, Mass., determined to save a certain sum of money which was desired, by diminishing the cost of food, the diet being planned beforehand in such a way that though of low cost it would supply the needed protein and energy. The cost of foods (not including preparation) was only 9.4 cents per woman per day. The diet supplied 75 gm. protein, 78 gm. fat, 312 gm. carbohydrates, and 2,243 calories of energy per woman per day, and was regarded as fairly palatable. The study is regarded as "an excellent illustration of what can be done when it seems desirable to make the cost of the daily fare as low as is consistent with a reasonably palatable diet."

Dietary studies in Philadelphia and Chicago, 1892-93, Ellen H. Richards and Amelia Shapleigh (pp. 37-98).—Twenty-four dietary studies were made in the thickly congested districts of Philadelphia and 32 in similar localities in Chicago. Information was desired in order that charitable work might be carried on intelligently, especially as regards instruction in the selection and preparation of food, household management, etc. In Philadelphia the average cost of the diet was 22.8 cents per person per day, and it furnished 115 gm. protein, 102 gm. fat, 476 gm. carbohydrates, and 3,308 calories per person per day. In Chicago the cost of the daily food was 26.8 cents per person per day, the protein, fat, and carbohydrates supplied being 127, 149, and 457 gm., respectively, and the fuel value being 3,664 calories. The individual dietaries are discussed in detail and in many cases suggestions are made for improving the diet without materially increasing its cost.

"Considering the net results of these dietary studies they were of undoubted value to the settlement associations under whose auspices they were made. They furnished more accurate information than could have been gained otherwise regarding the ways of living, the adequacy of the diet, and the faults in methods of purchasing, cooking, and serving food. The information gained, it is believed, has been utilized in many ways to the advantage of all concerned."

The cost of food as related to its nutritive value, R. D. MILNER (*U. S. Dept. Agr. Yearbook 1902, pp. 387-406*).—The relative value of different foods is discussed, the fact being emphasized that the amount of nutritive material present determines the real value of the food rather than its cost per pound. Common food materials are divided into groups designated cheap, medium, and expensive, as regards sources of both protein and energy. The relative value of a number of common foods is discussed and ways suggested in which the results of nutrition investigations in general may be made of practical use.

Inorganic salts in relation to nutrition (*British Med. Jour., 1903, No. 2219, pp. 93, 94*).—A discussion summarizing data on value of different inorganic salts in the nutrition of man and animals.

The dietetic values of food stuffs prepared by plants, G. HENSLOW (*Jour. Roy. Hort. Soc. [London], 27 (1903), No. 4, pp. 968-976, figs. 2*).—The author summarizes and discusses data regarding the food value of plants and the forms in which the nutritive material occurs.

The physiological action of betaïne extracted from raw beet sugar (*British Med. Jour., 1903, No. 2224, p. 380*).—A brief note on a recent investigation by Waller and Plimmer which showed that betaïne has a marked physiological effect. In view of this the need of careful purification of beet sugar is pointed out.

The victualling of the royal navy: Past, present, and future, A. TURNBULL (*London: Elliot Stock, 1903, pp. 31*).—A compilation of data regarding the rations issued to the British navy in the past and at the present time, together with a sum-

mary of the report of a committee appointed by the Lords of the Admiralty which proposes a number of changes.

The food factor in education (*British Med. Jour., 1903, No. 225, pp. 424, 425*).—The diet commonly found in British schools is discussed and suggestions for improvement are made, as it is regarded as inadequate.

Composition of the principal proteids in foods, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 6 (1903), No. 33, pp. 205, 206*).—A brief summary.

Food and food adulteration, J. B. WEEMS (*Dietet. and Hyg. Gaz., 19 (1903), No. 9, pp. 513–518*).—The extent of food adulteration, the need of legislation to restrain it, and similar topics are discussed.

Chemical composition of foods and condiments, J. KÖNIG and A. BÖMER (*Chemische Zusammensetzung der menschlichen Nahrungs- und Genussmittel. Berlin: Julius Springer, 1903, vol. 1, 4. ed., pp. XX+1535, figs. 4*).—It is stated that the revision of the new edition of this valuable handbook has been prepared by Professor Bömer. The original form of reporting the analytical data in considerable detail has been adhered to, the large amount of recent analyses published since the earlier editions being included, in addition to the older material. The introductory chapter on the theory of nutrition has not been retained, as it is planned to elaborate this subject in a subsequent volume.

Seventh report on food products, A. L. WINTON ET AL. (*Connecticut State Sta. Rpt. 1902, pt. 3, pp. 179–325, figs. 36*).—In the introduction to this report, by E. H. Jenkins, it is stated that during the year 1,205 samples of foods and food products purchased by the station, or submitted to it, were examined, as well as 662 collected by the State Dairy Commission, making a total of 1,867 samples.

Milk, A. L. Winton, M. Silverman, and E. M. Bailey (pp. 183–195).—Of the 292 samples of milk purchased from milkmen, 10.9 per cent were found to be adulterated, in 4 cases by the use of added preservatives, in 7 cases by dyes, and in the remainder by watering and skimming. Analyses are also reported of a sample of preserved cream and a number of samples of milk which were not collected by the station.

Carbonated nonalcoholic beverages and fruit flavors, A. L. Winton, A. W. Ogden, M. Silverman, and E. M. Bailey (pp. 195–215).—Two hundred and eleven samples of sirups, fruit juices, and carbonated beverages were analyzed, and 72 were found to be unadulterated. The majority of them contained coal-tar dyes. Added preservatives were also common. A sample of lemon extract and 3 samples of vanilla extract were examined and were all free from adulteration.

Sweet pickles, A. L. Winton and A. W. Ogden (pp. 216–221).—Only 1 of the 18 samples of sweet pickles (cucumbers and other vegetables) examined was free from glucose, saccharin, or chemical preservatives. Most of the pickles contained small quantities of alumina and sulphuric acid, and 1 sample was colored with copper. The methods of examination are described.

Lard, A. L. Winton and A. W. Ogden (pp. 221–227).—During the year 166 samples of lard were examined, 55 of which were adulterated.

Cheese, A. L. Winton and E. M. Bailey (pp. 228, 229).—The fact that various soft cheeses sold in jars, tin-foil packages, etc., differ in keeping qualities led to an examination for added preservatives with the result that borax was found in 7 samples. Fourteen samples were not adulterated.

Maraschino cherries, A. L. Winton and E. M. Bailey (pp. 229, 230).—Six brands of Maraschino cherries were examined and coal-tar dye found in all.

Ground spices, A. L. Winton and E. M. Bailey (pp. 230–245).—During the year 233 samples of spices were examined, of which 40 were found to be adulterated.

Coffee, A. L. Winton (pp. 246–248).—Only 3 of the 33 samples of coffee examined were found to be adulterated. A marked decrease in the adulteration of this class of goods during the last 7 years is noted.

Cocoa, A. L. Winton, M. Silverman, and E. M. Bailey (pp. 248–255, 257–263).—Cocoa

products and methods of examination are described and analyses reported of samples of 45 brands. Of these 12 were found to be adulterated and 7 to be compound cocoa.

Miscellaneous samples, A. L. Winton, M. Silverman, and E. M. Bailey (pp. 255, 256).—Proximate analyses are reported of gluten bread and a preservative for yeast, as well as examinations for the detection of adulterants of cream of tartar, sage, granulated sugar, butter, curd, canned beets, green tea, preserving mixture, baking powder, and vinegar, and the alcohol content of several samples of liquors.

Food products examined for the dairy commissioner in the twelve months ending July 31, 1902 (pp. 264, 265).—A number of samples of butter, molasses, honey, and vinegar were examined for the State commissioner in dairying, the results being briefly reported.

The effects of roasting on the chemical composition of cocoa beans, A. L. Winton, M. Silverman, and E. M. Bailey (pp. 265–269).—Taking into account the work of earlier investigators, the changes brought about in cocoa beans by roasting are discussed and analyses reported of a test made with raw and roasted Caracas cocoa beans, one sample being roasted at a lower heat than is customary, a second in the usual manner, and a third at an abnormally high heat. The operation of roasting was conducted in a chocolate factory by skilled workmen in the presence of a representative of the station. So far as could be judged by the analyses, the chemical composition of the cocoa nibs was altered little, if at all, by roasting. Apparently no starch was converted into dextrin or other soluble carbohydrates, nor were the percentages of fat or the fat constants changed, nor the theobromin, caffein or other nitrogenous substances altered. The crude fiber content in the roasted samples was slightly increased, probably owing to the presence of a little finely-divided charcoal from the shells which was constantly present.

"These results do not by any means prove that only the mechanical condition of the nibs is affected by roasting and no chemical change whatever takes place during the process. As a matter of fact, the flavor of roasted beans is materially different from that of the raw beans, and this must be due to some difference in chemical constitution, but this difference would appear to be slight and justifies the adoption of standards of composition based on analyses of beans roasted at a medium heat."

Analyses of authenticated samples of cocoa beans, A. L. Winton, M. Silverman, and E. M. Bailey (pp. 270–287).—Analyses are reported of a number of samples of roasted cocoa nibs, roasted cocoa shells, and roasted unshelled cocoa beans. Methods are described and the analytical data discussed with reference to its bearing upon the composition of chocolate and the fixing of standards of composition.

The anatomy of edible berries, A. L. Winton (pp. 288–325).—Extended studies are reported of the following American edible berries: Cultivated strawberry, American field strawberry, American red raspberry, black raspberry, blackberry, dewberry, red currant, black currant, American gooseberry, European gooseberry, American cranberry, and huckleberry; and of some European species, including the forest strawberry, European raspberry, and mountain cranberry.

While the special purpose was to accumulate data for use in the examination of jams, preserves, etc., the author's investigations furnish a large amount of information regarding the macroscopical and microscropical appearance of the different berries and their normal structure, the text being supplemented by numerous drawings. Detailed directions are given for the examination of jams and preserves made from the various berries, attention being called in every case to the more striking features which may be expected.

A German translation[a] of this article has previously appeared.

Canned meats, A. McGill (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 85, pp. 3, 4*).—Ninety-nine samples of canned meats were examined. With the exception

[a] Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), pp. 785–814.

of 5 samples they were in good condition. Boric acid was found in 21 samples, but in no case "has it exceeded the limit fixed by the British Parliamentary Commission, viz, 0.5 per cent, and in most cases it has fallen markedly below this amount."

American corn meal and hominy in France, T. Haynes (*U. S. Consular Rpts. 73 (1903), No. 276, pp. 101, 102*).—In order to secure any extended market for American corn meal the author believes that it must be marketed in more satisfactory packages, sold for a more reasonable price, and methods of preparation suggested which are in keeping with the dietary habits of the French people.

Arrowroot, C. T. Musson (*Agr. Gaz. New South Wales, 14 (1903), No. 5, pp. 452, 453, figs. 2*).—Directions for extracting starch on a small scale from *Canna edulis* are given.

Canned vegetables, A. McGill (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 87, pp. 9*).—With 2 exceptions all of the 100 samples of canned vegetables examined were found to be in good condition and in no case were added preservatives found. Traces of copper were found in 2 samples of canned peas and a larger amount in a sample of French peas.

The principal vegetables used as food in the French Colonies, Balland (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 15, pp. 934–936*).—The composition is reported of peanuts, *Cajanus indicus*, several varieties of beans, and the so-called African peanut (*Voandzia subterranea*).

The chemical composition of nuts used as food, J. B. Weems and Alice W. Hess (*Proc. Iowa Acad. Sci., 10 (1902), pp. 108–111*).—Analyses of a number of native and foreign nuts are reported and their food value discussed.

Coffee substitutes (*Agr. News [Barbados], 2 (1903), No. 36, p. 281*).—A note on the use of soy beans as a coffee substitute.

Sources of sugar, C. A. Kern (*Dietet. and Hyg. Gaz., 19 (1903), No. 9, pp. 522–524*).—A popular article discussing the manufacture of sugar from various sources, a number of which are unusual.

Preservation of cane sirup, W. R. Dodson (*Louisiana Stas. Bul. 75, 2. ser., pp 236–249*).—Believing in the desirability of preserving cane sugar as a means of increasing its home consumption and sale, tests were undertaken to learn the value of various methods. Attempts to preserve sirups in small quantities by the ordinary household methods employed in preserving fruit were entirely successful, but attempts to preserve sterilized sirup of 22° Baume density in large quantities in sterilized kegs did not succeed. However, sirup of 36° density so preserved fermented very little, while similar sirup not sterilized fermented very badly. The author believes, therefore, that "thick sirup, sterilized in tight wooden vessels, can be kept practically without fermentation during the entire summer."

The belief is rather widespread that filtering cane juice through Spanish moss materially increases the keeping qualities of sirup made from it and prevents crystallization. As shown by a number of experiments there is no foundation for this belief.

A number of tests which had to do with the causes of fermentation are reported, leading to the conclusion that cane fermentation is due to micro-organisms introduced from without and not to enzyms present in the cane. Freezing the cane facilitated the entrance of the micro-organisms causing fermentation.

The enzyms of the sugar cane, C. A. Browne, Jr. (*Louisiana Stas. Bul. 75, 2. ser., pp. 249–256*).—The presence of enzyms was demonstrated in sugar cane, including a catalase, an oxidase, and a peroxidase, the first 2 being always and the latter sometimes present.

Special device for keeping sirup in a sterile condition, W. R. Dodson (*Louisiana Stas. Bul. 75, 2. ser., pp. 256–258, fig. 1*).—A modified form of faucet is described which was designed to permit the withdrawing of a small quantity of sterilized sirup from a large vessel without disturbing the sterile condition of that which remains.

Relation of bacteria to the inversion of crystallized sugars, W. R. DODSON (*Louisiana Stas. Bul. 75, 2. ser., pp. 259–263*).—Recognizing the fact that unrefined sugars are subject to inversion during storage or transportation over long distances, bacteriological studies were undertaken, and a bacterium isolated which is regarded as the cause of the inversion. The test led to the following conclusions:

"Sugar that was sterilized and not inoculated with any organism did not deteriorate in purity. Sugar sterilized and inoculated with pure cultures of organisms found in inverting sugars show a decided inversion. There is no reason to believe that any other agent than the organism introduced was responsible for this inversion."

The character of the bacterium was not fully determined, but it is planned to continue the work.

Preservation of eggs, R. GUENTHER (*U. S. Consular Rpts., 73 (1903), No. 276, pp. 66, 67*).—A note on the successful use of water-glass solution for preserving eggs.

Preserving eggs (*Agr. Gaz. New South Wales, 14 (1903), No. 5, pp. 472, 473*).—A number of experiments carried on in Germany are briefly quoted, which show that the best results were obtained when eggs were either varnished with vaselin, immersed in limewater, or in water-glass solution.

Hens' eggs, E. CARPIAUX (*Bul. Inst. Chim. et Bact. Gembloux, 1903, No. 73, pp. 39–51*).—Noted from another publication. (E. S. R., 15, p. 64.)

ANIMAL PRODUCTION.

The value of oak leaves for forage, W. W. MACKIE (*California Sta. Bul. 150, pp. 21, figs. 10*).—Having noted that live stock readily eat the leaves of certain oaks, the author studied the chemical composition and food value of the leaves of a number of species found in the northern coast ranges of California, and also the leaves of poison oak. In addition to the usual data the tannin in the leaves was determined.

The results of analyses of the different kinds of foliage follow, the leaves being gathered in every case in the fall when they were fully mature:

Composition of oak and poison oak leaves.

Species.	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Fiber.	Tannin.	Ash.
Live oaks:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Scrub oak (*Quercus dumosa*)	3.90	9.16	5.26	31.41	26.79	14.06	9.12
Cañon live oak (*Q. wislizeni*)	3.51	10.95	5.86	30.89	29.48	9.62	9.66
Maul oak (*Q. chrysolepis*)	6.53	8.32	3.50	31.52	30.35	10.16	9.62
Deciduous oaks:							
Blue oak (*Q. douglasii*)	5.21	8.32	4.25	34.55	33.35	5.00	9.32
Black oak (*Q. californica*)	5.10	8.15	7.06	40.50	19.22	10.62	9.35
Mountain white oak (*Q. garryana*)	4.59	15.05	5.47	40.18	16.26	9.01	9.44
Poison oak (*Rhus diversiloba*)	5.39	6.85	6.50	41.05	25.13	6.42	8.66

It was observed that the poisonous oil of poison oak is apparently volatile at a comparatively low temperature, as samples dried at ordinary room temperature did not produce poisonous effects.

In general all the leaves examined possessed a high crude fiber content and less nitrogen-free extract than leguminous crops. The resins present "have pungent and disagreeable flavors, which render them distasteful to stock. A good example of this is seen in the *Quercus californica*. The leaves of the young trees and shrubs of this species contain no more tannin than those of most of the other species, are only 1¼ per cent below alfalfa in nitrogen-free extract, have a fair amount of protein, are low in crude fiber, and are large and soft. These qualities should produce a feed superior to oat hay. This is not the case, however, for stock avoid it to a great extent on account of the resins and waxes in the dense tomentum covering the leaves. These

waxes and resins serve as a protection against drying winds and severe weather, and all the oaks have more or less of them.

"As compared with the crude fiber and resins, tannin of oak leaves, as before stated, is not only bitter and astringent, but interferes with digestion. . . . In summing up the value of the forage oaks, from chemical analyses and observations in the field, the conclusion is reached that the facts observed in the field coincide in most cases with those determined by analysis. For instance, the deciduous oaks possess a higher nutritive value than the live oaks and are, as would be expected, more readily eaten by horses, cattle, sheep, and goats. In some cases, however, certain physical conditions modify these relations. This is true in the case of the live oaks. These contain a sufficiently high proportion of nutrients, and yet only sheep and goats thrive upon them. This is due to the thick, harsh leaves with their spinescent teeth, which prevent horses and cattle from relishing them.

"Although all stock prefer the deciduous oaks of the higher altitudes, yet indiscriminate pasturing causes much damage to the forests and ground-cover. When sheep and goats are allowed to browse on the deciduous oaks of the timbered area, they kill the seedling conifers by nibbling and trampling, kill the shrubs by overbrowsing, and cut up the slopes in trails which become deep gullies during the rainy season. This could be avoided by pasturing the sheep and goats on the 'live oaks' of the lower chapparal or brush areas, the only necessary precaution being to prevent too many congregating in one place, thus avoiding too much trampling and gullying.

"Since cattle and horses are unable to thrive on the live oaks, and since they do not browse close enough to kill shrubs, never browse on young conifers, nor cut up slopes by trails, they may profitably be pastured on the timbered areas and on the higher altitudes. Thus, this oak area, comprising half the whole State, can, by a conservative and well-regulated system of browsing, be made to pasture sheep and goats throughout the year, and all stock during the summer months; and also during seasons of drought or when winter conditions make other feed inaccessible."

Feeding stuff inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 92, pp. 53–68*).—In accordance with the State feeding stuff law, analyses were made of a large number of samples of concentrated feeding stuffs sent by correspondents and collected by the Station, including cotton-seed meal, linseed meal, flax meal, gluten meals and feeds, Fourex (dried distillers' grains), bran, red dog flour, meat meal, animal meal, beef scraps, bone and meat meal, mixed feeds, proprietary feeds, cereal breakfast food by-products, and calf meal. In general it is noted that the amount of impure cotton-seed meal sold in the State was a very small percentage of the whole, and that the feeding stuffs compared favorably with the guaranteed composition.

"In the fall of 1899 the State was flooded with low grade, adulterated wheat brans and mixed feeds. Because of the publicity given to these fraudulent goods and the cooperation of the best of the large dealers, they have quite largely disappeared, or are sold under a proper guaranty. There is so much profit in selling ground corn cobs and broom corn at the price of wheat bran that the consumer must ever be on the watch against this fraud. The safest thing is to buy only well-known reliable brands of this class of goods."

The feeding value of the dried distillers' grains was tested with 6 cows, all in milk, for about 3 months. They had been fed a mixture of wheat bran, cotton-seed meal, and linseed meal, 2 : 2 : 1, in addition to corn silage and mixed hay. Dried distillers' grain mixed with bran in the proportion of 30 to 5 was gradually substituted for this and fed for 22 days, and was then gradually replaced by the first ration. The total milk yield for 22 days on the oil meal ration (comprising 11 days before and 11 days after the period on dried distillers' grain) was 2,879.2 lbs. The total milk yield in the same time on distillers' grain was 2,989.8 lbs. In other words, the cows maintained their milk yield on the dried distillers' grains. This feed, according to

the authors, "has about the same composition as gluten meal. It is readily eaten by stock and is a safe food for milch cows when fed by itself or in combination with other grain feeds."

Concentrated feeding stuffs, L. A. VOORHEES and J. P. STREET (*New Jersey Stas. Bul. 165, pp. 47*).—The feeding stuffs analyzed this season under the State law included cotton-seed meal and feed, linseed meal, germ meal, gluten meals and feeds, hominy meal, maizeline feed, cerealine feed, corn brans, distillers' grains, malt sprouts, dried brewers' grains with and without molasses, mixed commercial feeds, cereal breakfast food by-products, calf meal, animal meal, poultry feeds, wheat brans, feeding flour, rye and wheat middlings, rye chop, buckwheat bran or middlings, barley feed and meal, and peanut bran, middlings, and vines.

"Of the 214 samples which are guaranteed and of which an examination has been made, 69 fail in their promises, 50 of these being deficient in protein. Among the 242 samples of feeds not required to be guaranteed, 215 are found to be of normal composition, about 24 vary from the same, for various reasons, and 3 are adulterated. Particularly to be avoided are the materials which contain hulls of other seeds or of their own in excess of that normally present."

Analyses of concentrated commercial feed stuffs, W. FREAR (*Pennsylvania State Dept. Agr. Bul. 107, pp. 61*).—During the year 1902 analyses were made under the State feeding stuff law of 263 samples of cattle feeds, including cotton-seed meal and feed, linseed meal, rye chop and feed, malt sprouts, dried brewers' grains, rice feed, oat feeds, corn chop, hominy feeds, gluten meals and feeds, cerealine feeds, corn bran, germ oil meal, sugar feed, maizeline, mixed feeds, breakfast food by-products, condimental feeds, animal meal, wheat bran, middlings, feed, chop, screenings, and germ middlings. The different classes of feeds are discussed at some length as regards their quality. A general failure to comply with legal requirements as to guaranty was observed.

The composition and digestibility of prairie hay and of buffalo-grass hay, J. T. WILLARD and R. W. CLOTHIER (*Trans. Kansas Acad. Sci., 18 (1901–2), pp. 59, 60*).—Noted from another publication (E. S. R., 13, p. 480).

The feeding value of rice products, C. A. BROWNE, Jr. (*Louisiana Planter, 30 (1903), Nos. 24, pp. 383–385; 25, pp. 398–401*).—In a paper presented before the Louisiana Sugar Planters' Association, rice products are described, their feeding value discussed, and investigations carried on at the Louisiana Station briefly reported. The latter include determinations of the composition of rice bran, polish, meal, hulls, and straw, and digestion experiments with steers.

On an average rice bran was found to have the following coefficients of digestibility: Dry matter 58 per cent, protein 64.7 per cent, fat 54.8 per cent, crude fiber 13.8 per cent, nitrogen-free extract 78.1 per cent, and ash 33 per cent; and rice polish, dry matter 82.5 per cent, protein 65.6 per cent, fat 73.6 per cent, crude fiber 22.1 per cent, nitrogen-free extract 92.7 per cent, and ash 31.4 per cent. A number of rations for mules are suggested which contain rice products. The paper is followed by a discussion.

Dried sugar beets as food for farm animals, G. H. MURPHY (*U. S. Consular Rpts., 73 (1903), No. 276, pp. 108, 109*).—A brief note quoting statements published in the *Blätter für Zuckerrübenbau* on methods of drying beets and the value of the product as a feeding stuff.

White beans as a stock food, C. S. PLUMB (*Breeders' Gaz., 43 (1903), No. 14, p. 679*).—According to the experience of a number of farmers in Michigan, waste beans not suitable for market are a satisfactory feeding stuff for farm animals. The opinion was generally held by local feeders that beans could be given to all classes of stock. In the experience of one of the feeders quoted, a mixture of corn, oats, and ground beans 2 : 1 : 1 gave good results with horses, cattle, sheep, and pigs.

"The beans are fed cooked to pigs, but to other classes of stock in the dry and

ground or unground condition, as the feeder sees fit, though to cattle ground." Bean pods are commonly used as coarse fodder and are highly praised as a food for sheep. "The universal testimony seemed to be that beans and pods both acted as a laxative and should be fed with great discretion. When fed with care, however, good results were secured."

Waste beans as stock feed (*Pacific Rural Press, 65 (1903), No. 17, p. 262*).—The use of stained beans by local dairy and poultry feeders is noted and statements regarding the feeding value of beans are quoted from the article noted above.

The anatomy of the fruit of certain cultivated sorghums, A. L. WINTON (*Connecticut State Sta. Rpt. 1902, pt. 3, pp. 326–338, figs. 8*).—Microscopical studies are reported of the seeds of a number of sorts of sorghum with a view to accumulating data for use in detecting the materials used to adulterate cattle feeds. A German translation [a] of this article has previously appeared.

American wheat screenings, A. L. WINTON (*Connecticut State Sta. Rpt. 1902, pt. 3, pp. 339–358, figs. 14*).—Noted from another source (E. S. R., 14, p. 1101).

Rôle of albuminoids in the nutrition of animals, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 6 (1903), No. 34, pp. 240, 241*).—A brief discussion of the nutritive value of protein and the protein requirement of different animals.

Feeding experiments with materials containing the pyrimidin group, H. STEUDEL (*Ztschr. Physiol. Chem., 39 (1903), No. 2, pp. 136–142*).—A brief account of an experiment in which a dog was fed pseudouric acid, isouric acid, etc.

Subcutaneous alimentation and bile formation, A. G. BARBERA (*Arch. Ital. Biol., 38 (1902), No. 3, pp. 447–455; abs. in British Med. Jour., 1903, No. 2229, Epit., pp. 43, 44*).—From experiments made with dogs the conclusion is drawn that the subcutaneous injection of nutritive material is of little value and does not compare at all favorably with the results obtained with rectal feeding.

The relation between body size and nutrient requirements in the case of dogs at rest and at work, B. SLOWTZOFF (*Arch. Physiol. [Pflüger], 95 (1903), No. 3–4, pp. 158–191*).—Experimenting with dogs the author determined the respiratory quotient under various conditions, with the special object of securing data regarding some of the fundamental principles of nutrition in relation to the production of work. The following conclusions were drawn: For motion of forward progression the work required for a uniform weight and distance is inversely proportional to the size of the animal. Metabolism is directly dependent upon the surface area of the animal in a condition of rest, although it appears that metabolism is not determined by this factor alone. During forward progression the energy expenditure is only approximately proportional to surface area and is affected by other factors which are not well understood. In climbing an incline the energy expenditure varies with different animals and no direct connection between it and body size was noted.

The effect of speed, body temperature, and training upon metabolism during rest and work, N. ZUNTZ (*Arch. Physiol. [Pflüger], 95 (1903), No. 3–4, pp. 192–208*).—On the basis of the experiments of B. Slowtzoff, noted above, and additional data from the author's experiments and those of other investigators, the effects on metabolism of speed, body temperature, and skill gained by practice are discussed, and the results obtained with man and the lower animals compared. According to the author it appears that with dogs speed does not markedly affect the amount of material required for unit distance covered, dogs differing in this respect from man and horses. When body temperature is increased the amount of material required for the resting body and for the work of respiration is also increased. On the other hand the muscles perform a definite piece of work with the same expenditure of force as at normal temperature.

[a] Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), p. 337.

The material required by the muscles for the performance of a definite piece of work is very markedly diminished by training. However, training does not induce a like saving when other sorts of work are performed. Any considerable training of the muscular system increases metabolism while the subject is at rest in the same way as does the consumption of an excessive amount of protein. The author notes that in the case of man and horses the amount of nutritive material required to raise 1 kgm. 1 meter in climbing an incline is about the same as in the case of dogs, being 2.96 kgm. as compared with 2.91 kgm.

Beef production in New England, J. W. SANBORN (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 61–84*).—The possibilities for the development of the beef industry in New England are pointed out and considerable data are summarized. The paper is followed by a discussion.

Sheep, cattle, pigs, H. H. CHAPMAN (*Minnesota Sta. Bul. 81, pp. 239–244*).—In this discussion of the feeding and management of sheep, cattle, and pigs under local conditions, the experience gained at the Northeast Experiment Farm is especially drawn upon. Attention is particularly directed to the value of sheep for clearing brush from new land, and the fact is pointed out that although they will live entirely upon brush they can not make satisfactory gains under such conditions. In the experience of the station, sheep on brush alone become poor, lambs will not grow well, and the ewes fall off in milk yield, yet they will destroy it more quickly than when supplied with other feeds in addition. When it was desired to supplement brush, the sheep have been hurdled on such crops as corn, oats, clover, timothy, winter rye, and rape, grown in small fields in 5-year rotation.

Lamb feeding, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 80, pp. 3–22, fig. 1*).—The relative value of some grains recently introduced, namely, spelt and macaroni wheat, as compared with more staple grains, was studied with 9 lots each containing at the beginning of the trial 9 lambs weighing about 81 lbs. each and all about 9 months old. The advantage of grinding grain was also taken into account in the case of the spelt and the macaroni wheat, but as it was observed that when finely ground they were not relished, these grains were only cracked during the greater part of the trial. No attempt was made to feed a balanced ration, "but the conditions in every respect were such as should be provided by the average farmer." For the first 88 days of the trial all the lambs were fed prairie-grass hay in addition to grain and *Bromus inermis* hay during the remainder of the test. All the lots were kept in sheds with yards.

On the different grain rations the average daily gain per head during the 109 days of the trial were as follows: Corn 0.35 lb., wheat 0.37 lb., macaroni wheat 0.35 lb., whole spelt 0.35 lb., ground spelt 0.31 lb., corn and bran 0.37 lb., whole macaroni wheat and bran 0.34 lb., ground macaroni wheat and bran 0.31 lb., and whole spelt and bran 0.34 lb. The amount of grain eaten per pound of gain ranged from 4.6 lbs. with the lot fed corn to 6.8 lbs. with the lot fed whole spelt and bran; and the cost of a pound of gain from 4.1 cts. with the corn-fed lot to 6.5 cts. with the lot fed ground spelt.

Toward the close of the trial the lambs were sheared, the fleece ranging from 59 lbs. with the lot fed ground macaroni wheat and bran to 69 lbs. with the lot fed whole wheat. That shearing apparently had an effect on the gains made is shown by the fact that after shearing the average daily gain was 0.64 lb. per head as compared with 0.28 lb. per head before shearing. The lambs were sold in Chicago and were regarded as of superior quality. Some of the principal conclusions follow:

The gain was most cheaply made on whole corn, but the most uniform gain was made with whole wheat. Macaroni wheat and bread wheat proved of equal value as regards the gains made, but gain was more cheaply made on the former when fed whole than on the latter. Adding bran to the ration increased the cost of gain. Grinding grain was not profitable as it decreased the palatability of the ration and

therefore interfered with the gains. Less grain was consumed with *Bromus inermis* hay than with prairie-grass hay. The lambs were dipped before the feeding test and this was regarded as beneficial since it killed external parasites and improved the quality of the wool. Analyses are reported of the spelt and the wheats fed.

Fattening sheep on grass, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 80, pp. 23–27*).—To learn something of the possibility of utilizing partially dried pasturage, with and without grains, in the fattening of lambs for the early winter market, 6 lots of 10 common-grade ewes, from 1 to 6 years old and weighing about 120 lbs. each, were pastured from September 6 to November 2, each lot having the run of 2 acres of native prairie grass which had not that season been pastured or cut for hay. All the lots except one were fed grain, the sheep on corn and on oats each making an average daily gain of 0.44 lb. per head, those on bread wheat 0.31 lb., on spelt 0.29 lb., and on barley 0.38 lb. The grain eaten per pound of gain ranged from 3.9 lbs. with the corn-fed lot to 7.2 lbs. with the sheep on spelt, and the cost of a pound of gain from 3 cents on oats to 5.3 cents on bread wheat. With the sheep fed no grain there was a total loss of 52 lbs. During the last 2 weeks of the trial it was noted that the losses were about twice as great as during the preceding 2 weeks and that the gains made by the other lots were correspondingly lower during the same period. This was accounted for in part by the fact that the grass had been considerably injured by frost.

The authors state in effect that the natural condition of grasses in an average season is well suited to the economical production of mutton; but that when sheep are turned on a partially dried up prairie-grass pasture a gradual decrease in weight is to be expected in case there are unusually heavy rains during the fall, unless they are fed grain. The grains giving the best results (corn, oats, and barley) also give the largest yield and are widely grown.

Sheep feeding at Jemalong, A. A. DUNNICLIFFE (*Agr. Gaz. New South Wales, 14 (1903), No. 5, pp. 385–399, figs. 16*).—Under government supervision an experiment was carried out on a large scale, which demonstrated the possibility of profitably feeding sheep on crops grown on irrigated land in time of drought. In the test over 1,600 sheep were used. For 18 weeks they were fed alfalfa twice a day, an acre supplying the fodder for 75 sheep. The cost of production, including irrigation, cutting, interest on capital, etc., was found to be 25 cts. per ton of green fodder. The water for irrigating the alfalfa fields was pumped from a small stream.

Rearing and fattening of pigs, S. SPENCER (*Jour. Bd. Agr.* [*London*], *10 (1903), No. 1, pp. 1–16*).—A general summary.

Selecting and judging horses for market and breeding purposes, W. J. KENNEDY (*U. S. Dept. Agr. Yearbook 1902, pp. 455–468, fig. 1*).—The author discusses the possibilities of horse breeding in this country, and points out that under existing conditions there are at least four classes of horses which farmers can profitably produce—namely, heavy draft horses, carriage or coach horses, roadsters, and saddle horses.

Horse breeding in South Africa, C. H. BLACKBURNE (*Transvaal Agr. Jour., 1 (1903), No. 4, pp. 57–59, figs. 2*).—The need of high-grade sires is spoken of and methods of improving horses proposed, which include government aid. South Africa, in the author's opinion, affords a fine opportunity for extensive horse breeding.

Some inexpensive ways of making farm poultry more profitable, J. H. ROBINSON (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 395–407*).—A general discussion.

Poultry culture in Ireland, H. DE COURCY (*Reliable Poultry Jour., 10 (1903), Nos. 5, pp. 534, 535; 6, p. 601; 7, p. 669; 7, Sup. p. VI, figs. 9*).—The poultry industry in Ireland is discussed with especial reference to the efforts made by the Irish agricultural societies for its development.

Distribution and magnitude of the poultry and egg industry, G. F. THOMP-

SON (*U. S. Dept. Agr. Yearbook 1902, pp. 295–308, dgm. 1*).—A statistical article based largely on publications issued by the U. S. Census Office.

Squab raising, W. E. RICE (*U. S. Dept. Agr., Farmers' Bul. 177, pp. 31, figs. 11*).—On the basis of personal experience pigeon raising is discussed with special reference to breeds and breeding, feeds, management, dressing, and marketing, and diseases, parasites, and remedies. Profitable pigeon raising, it is said, depends upon securing the right kind of stock, careful attention, and proper management. Homing pigeons and Dragoons are regarded as the best breeds, while a cross between the two is also favorably mentioned. A large house is better and more economical than several small ones, but in no case should accommodate more than 200 pairs. Pigeons require feed twice a day, the best sorts being cracked corn, red wheat, Kafir corn, millet, peas, hemp, and rice. The importance of varying the diet is insisted upon as well as plenty of pure water for drinking and bathing, and attention to the sanitary condition of houses, nests, and yards.

The educational value of live-stock exhibitions, G. M. ROMMEL (*U. S. Dept. Agr. Yearbook 1902, pp. 259–264*).—A general discussion of the subject emphasizing the fact that well-conducted exhibits are profitable both to the exhibitor and the spectator.

DAIRY FARMING—DAIRYING.

Records of individual cows on dairy farms, A. J. GLOVER (*Illinois Sta. Bul. 85, pp. 44, figs. 23*).—Farm tests were made of 8 different herds, containing in all 176 cows, records of 144 cows being obtained for a full year. Composite samples, representing 14 consecutive milkings, were obtained every seventh week and tested with the Babcock test. The necessary apparatus was furnished by the station. The different herds are described and illustrations are given of many of the cows. The rations fed are also given and commented upon.

The best individual record was 8,949 lbs. of milk and 472 lbs. of butter, and the poorest 1,482 lbs. of milk, and 68 lbs. of butter. With the exception of one improved herd the average production, considered as representing that of the ordinary cows in Illinois, was 4,721 lbs. of milk and 173 lbs. of fat, equivalent to 202 lbs. of butter. The most profitable cow gave a net return of $57.22, and the poorest was kept at a loss of $17.83. The average net profit per cow was $9.96.

Comparative feeding experiment with palm-nut cake and shea-nut cake, M. RIPPER (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 7, pp. 620–627*).—In a test with 8 cows lasting 6 weeks palm-nut cake was compared with shea-nut cake, the residue from the manufacture of shea butter from the seed of *Bassia latifolia*. The two feeding stuffs had practically equal value. No injurious effects upon the health of the cows due to feeding the shea-nut cake at the rate of 1.5 kg. per day were observed.

Jersey cattle, their feeding and management (*London: Vinton & Co., Ltd., 1903, 2 ed., rev. and enl., pp. 97*).—This book is compiled from information received from members of the English Jersey Cattle Society. The additions in this edition relate mainly to diseases, especially parasitic gastro-enteritis.

Experiments on the influence of different methods of milking on the yield and quality of milk, H. MITTELSTÄDT (*Abs. in Centbl. Agr. Chem., 32 (1903), No. 3, pp. 197–201*).—The experiments confirmed the results obtained in Denmark as to the value of the Hegelund method of milking, which is warmly recommended.

The milk supply of two hundred cities and towns, H. E. ALVORD and R. A. PEARSON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 46, pp. 210*).—This bulletin gives descriptions of the milk supply of the 161 cities in the United States having a population of over 25,000 each, and of 39 selected cities and towns of smaller size. The statistical data collected are presented in a series of tables, and the legal

requirements relating to market milk in the different States and Territories are also compiled.

There is some supervision of the milk supply in practically all the cities of the United States having a population of over 50,000, while in the smaller cities and towns supervision is the exception rather than the rule. The methods followed vary widely as well as the character of the work performed. The inspection work consists for the most part of testing samples of milk for the content of fat and other solids. So far as the composition of the milk is concerned laws, ordinances, and regulations are considered quite well enforced, but beyond that their enforcement is very imperfect. In the discussion of the information presented in the bulletin many suggestions are made for the improvement of present conditions.

Economical methods for improving the keeping qualities of milk, C. F. Doane (*Maryland Sta. Bul. 88, pp. 117–164*).—The author discusses the source of bacteria in milk and practical means for controlling their growth, including in the bulletin the results of considerable original work consisting for the most part of tests of methods in common use.

Bacteria in milk are derived from the interior of the udder, from the exterior of the cow, from the milker, from the air, and from dairy utensils, nearly all of which sources can be regulated to a certain extent. The value of dampening the udder and flank before milking was shown by bacterial determinations in several trials. In cleansing utensils where steam is not available the author recommends the use of washing powders, the efficiency of this method having been shown in experiments reported in an earlier bulletin of the station.

In the purification of milk several tests were made with filters and separators. Milk filtered through animal charcoal which had been thoroughly washed in water was turned black, illustrating a difficulty in purifying milk by filtration as compared with purifying water. The use of separators for purifying milk by 2 city dairies failed to give satisfaction to consumers, the main objection being that milk so treated soured sooner than untreated milk. In 4 out of 5 trials made at the station the acidity of fresh samples of separated milk was found to be higher than that of unseparated samples, the difference in one instance being 0.03 per cent. The cause of this variation was not investigated. It is suggested, however, that it may be due to a change in the content of carbon dioxid, due to the process of separation. The results of the tests indicate that the use of the separator for purifying milk tends to lessen rather than improve its keeping qualities.

Determinations were made of the number of bacteria and the percentage of acid in aerated and unaerated milk. At the end of 24 hours there was no noticeable difference in the acid content, as shown by 11 trials conducted under ordinary dairy conditions. The development of bacteria was also unaffected to any marked extent by aeration. It is therefore believed that the keeping qualities of milk are not improved by aeration.

In a series of experiments the effect of cooling milk in different ways was studied. As the temperature of the well water in the State is commonly 60° F, this temperature was used as a basis for comparison. Milk cooled immediately to 60° was compared as regards acidity and germ content with milk cooled gradually by setting in running water at 60°. At the end of 5 hours the milk kept in running water had a temperature of about 64° when it was cooled quickly to 60° and both lots were kept at that temperature. In one of the four trials the milk cooled immediately remained in a condition fit for use 15 hours longer than the milk cooled gradually. In all trials the keeping qualities of the milk were improved by prompt cooling.

In the second experiment the keeping property of milk cooled immediately to 60° was compared with that of milk in a 5 gal. can set in a half barrel of water at 60°. At the end of 15 hours the milk set in standing water had a temperature of 66 to 74°, varying with weather conditions. It was then cooled to 60° and kept at that

temperature. The milk thus treated soured from 6 to 18 hours sooner than the control lots. Practically all the samples cooled immediately were fit for use at the end of 48 hours. In a third experiment milk cooled immediately to 60° was compared with milk cooled after standing for 2 hours, the results showing that the milk cooled immediately remained sweet for about 12 hours, on an average, longer than the milk not cooled until 2 hours after milking, illustrating the importance of prompt cooling.

Practical experiments were also made with the use of ice. A five gallon can of milk was set about 1 hour after milking in a half barrel of water to which a large piece of ice had been added, the temperature of the water being about 40°. This milk was compared with milk cooled within 15 minutes from the time of milking to 60° and kept at that temperature, the results showing no great advantage from the use of ice under these conditions. In other experiments it was found that from 2 to $2\frac{1}{2}$ hours were required for milk set in ice water to cool to 60°, and that such milk soured in some instances as much as 5 hours sooner than milk cooled immediately to 60°. In a second series of experiments similar to the above a temperature of 65° was used for comparison. Milk cooled immediately and kept at that temperature remained sweet for 30 to 35 hours, while milk not cooled other than by setting in water at 65° did not keep over 24 hours. The results of the work at 65° show the importance of prompt cooling and also that under ordinary conditions this temperature can not be depended upon in producing milk for city markets.

Milk set in a shotgun can in a refrigerator at 60° was found to have a temperature of 68 to 74° at the end of 15 hours, at which time the milk was on the point of turning. On the other hand, milk cooled immediately to the temperature of the refrigerator and kept at that temperature remained in good condition for about 50 hours.

After showing by the above practical experiments the need of keeping milk at a low temperature and particularly the need of cooling it immediately after milking, the author discusses the use of milk coolers, giving the results of several tests and also considers the use of refrigerators, preservatives, and the acid test.

During several weeks in the summer of 1902 determinations were made of the temperature, acidity, and bacterial content of milk as received at a large dairy in Baltimore, the data being tabulated and discussed along with observations on the shipping of milk over one of the railroads entering Baltimore.

Milk transportation: Freight rates to the largest fifteen cities in the United States, E. G. Ward, Jr. (*U. S. Dept. Agr., Division of Statistics Bul. 25, pp. 60*).—This bulletin contains not only transportation charges relating to milk, but descriptions of the different means of transportation employed and some general information regarding the milk supply of each city. About 850,000 gal. of milk and cream are required daily to supply the 15 cities. Considerable lack of uniformity was observed in the freight rates.

Clean milk, S. D. Belcher (*New York: Hardy Pub. Co., 1903, pp. 146, pls. 24*).—In the introduction to this book by W. H. Park the improvement of the milk supply and the transportation of milk are briefly discussed. The book itself is written from the standpoint of the bacteriologist and deals with means for lessening or preventing the contamination of milk. Such subjects as the construction and care of stables, the management of cows, milking, cleansing dairy utensils, handling and sale of milk, etc., are considered.

The sugar in the milk of the buffalo, C. Porcher (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 15, pp. 828–830*).—An examination of 2 samples from Italy and 2 from Egypt led the author to conclude that the sugar in buffalo's milk is identical with that in milk from other animals.

Butter industry in the Argentine Republic, E. W. Ames (*U. S. Consular Rpts., 73 (1903), No. 276, pp. 115–119*).—The exports in 1902 amounted to 9,021,020 lbs., nearly all of which was shipped to the United Kingdom.

Annual report of the experiment station for cheese making at Lodi, 1902 (*Ann. R. Staz. Sper. Caseif. Lodi, 1902, pp. 116*).—This contains a review of the work of the station during the year, the results of experiments on the utilization of skim milk in the feeding of calves, an account of the manufacture and composition of a full cream cheese of Lombardy designated Mascarpone, a discussion of the food value of margarine cheese, and notes on milk with inseparable fat on an instrument designated the coaguloscope, and on the progress of the dairy industry in Sardinia. Under the title of Milk with Inseparable Fat, G. Fascetti refers to a method of forcing milk through capillary spaces under a pressure of 250 atmospheres, which reduces the size of the fat globules and renders them incapable of rising to the surface on standing. In a sample of milk thus treated the fat showed no tendency to separate at any time, while an analysis showed the milk to be normal in composition. It is announced that a plant for the treatment of milk by this method is to be established at Lodi.

Dairying at home and abroad, H. E. Alvord (*U. S. Dept. Agr. Yearbook 1902, pp. 145–154, pls. 6*).—Dairying in different countries of Europe and in the United States are compared as regards breeds of dairy cattle, stabling, and feeding of cows, care and sale of milk, butter making, cheese making, etc. "While too much can not be said in praise of the industry, frugality, and thrift of most of the dairymen of Europe, a close comparison leads one to feel that the conditions of this industry in the United States are decidedly more satisfactory in almost every particular."

Dairying in Belgium (*Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 3, pp. 327–389*).—This includes several papers as follows: History of the Dairy Industry, and Commerce in Dairy Products, by A. C. Bovy; Instruction in Dairying, by Devuyst; Cooperative Dairies, by O. Bolle; The Dairy Station of the Agricultural Institute, by M. Henseval; Construction of Dairy Apparatus, by J. Vandervaeren; and Notes on Breeds of Cattle, by G. Mullie.

Study of the societies for dairy control in Denmark and their possible organization in Switzerland, C. Bauverd (*Jour. Soc. Agr. Suisse Romande, 44* (*1903*), *No. 3, pp. 43–114*).

Elements of dairying, J. W. Decker (*Columbus, Ohio: Author, 1903, pp. 115, figs. 21*).—Introductory notes are given on the history and present status of the dairy industry, following which the secretion, composition, and physical properties of milk; butter and cheese; contamination of milk; testing cows; market milk; and dairy refrigeration are discussed in a popular manner, the results of considerable experiment station work being incorporated.

VETERINARY SCIENCE AND PRACTICE.

Text-book of veterinary medicine, J. Law (*Ithaca: Author, 1903, vol. 5, pp. 532*).—This constitutes the final volume of the author's text-book of veterinary medicine and is devoted to a discussion of parasites and parasitism. The general subject of parasitism is briefly discussed by way of an introduction to the volume. The various parasitic fungi and insects are arranged according to their systematic position and each parasite receives an elaborate discussion, together with an account of the symptoms of disease produced by it and the best treatment to be adopted in combating it. The plant parasites discussed in this volume include the organisms of ringworm, thrush, and Actinomycosis, as well as various forms of Aspergillus. The parasitic insects which are discussed in the volume include the majority of important forms recognized as injurious to domestic animals.

Elementary lectures on veterinary science, H. Thompson (*New York: W. R. Jenkins, 1903, pp. 397, pls. 51*).—This volume contains 12 lectures, together with 3 appendixes, and is intended for use in veterinary instruction in all institutions offer-

ing veterinary courses. The classification of the lectures is as follows: Introductory, including various anatomical and physiological data; bones; muscles; hoofs and shoeing; digestive organs; dentition; circulatory and lymphatic systems; respiratory organs; nervous diseases, including those of the special senses; skin diseases; and urinary diseases. The number of specific diseases of various sorts which are mentioned in the volume is sufficient to include all the more important ones. In the appendixes valuable information is furnished in a brief form regarding the nature of various diseases and treatment to be given; the nature of various medicines; formulas for preparing veterinary medicines, and a tabulated list of medicines with the usual size of doses for horse, sheep, pig, and dog.

Treatise on surgical therapeutics of domestic animals, P. J. Cadiot and J. Almy (*Traité de thérapeutique chirurgicale des animaux domestiques. Paris: Asselin & Houzeau, 1903, vol. 2, 2. ed., pp. 744, figs. 310*).—In this volume the authors present a detailed and critical discussion of diseases of the withers, back, loins, chest, abdomen, tail, legs, and feet. The diseases of the abdomen are classified according to the organ or parts affected. The pathological conditions and surgical instruments used in the treatment of these affections are well illustrated.

The formation of precipitates during agglutination, M. Löwit (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), Nos. 2, Orig., pp. 156–166; 3, Orig., pp. 251–259, pl. 1*).—The author attacked the problem of determining the nature of agglutination in bacterial cultures. It was found that a homogeneous connecting substance in varying quantities was always to be demonstrated in cases of agglutination. This connecting substance exhibited a considerable affinity for eosin and certain other stains, and could therefore be demonstrated with considerable ease. The author believes, therefore, that he has furnished morphological proof of the fact that the agglutination of bacteria is to be considered as essentially a process of precipitation. The author concludes that in cases of agglutination precipitates are formed in and upon the bacteria concerned and perhaps also in the surrounding fluid. The substance necessary for the formation of the precipitate is believed to come from the bacterial cells.

On the protective substances of immune sera, E. W. A. Walker (*Jour. Hyg. [Cambridge], 2 (1902), No. 1, pp. 85–100*).—The experiments reported in this paper were made with typhoid bacillus upon guinea pigs. The following results were obtained: The quantity of immune body required for protection against a given number of minimum lethal doses of the bacterial organism is in general an equal number of cubic centimeters of the immune serum. The complement is a leucocytic ferment not strictly specific. It is increased by the process of immunization.

The relationship between toxin and antitoxin, P. Eisenberg (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), No. 3, Orig., pp. 259–283*).—The literature of this subject is critically reviewed in connection with a bibliography. The author found during his investigations that the relative amount of toxin required for the neutralization of the antitoxin varied according to the total amount of the mixture. Where large quantities of each were used a relatively larger amount of toxin was required for the neutralization of the antitoxin.

Further contributions to the theory of bacteriolytic immunity, R. Pfeiffer and E. Friedberger (*Centbl. Bakt. u. Par., 34 (1903), No. 1, Orig., pp. 70–84*).—The authors' experiments as reported in this article were concerned chiefly with the formation of immune bodies antagonistic to bacteriological amboceptors, with special reference to the vibrio of cholera. During these experiments it was found that in the serum of an animal treated with the immune serum of cholera, antiamboceptors arise which attack the cytophilous group of the amboceptors. The antiamboceptors possess no affinity for the receptors of the cholera vibrio. Antiamboceptors are relatively stable bodies which are not destroyed by subjection to 60° C. for ½ hour.

Experimental studies on disinfection by means of formaldehyde and steam, H. Herzog (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), No. 2, Orig., pp. 170–187, figs. 2*).—

During the experiments reported in this paper it was found that the disinfectant action of steam was considerably increased by the presence of formaldehyde fumes. Spores of *Bacillus mesentericus*, which resisted the action of steam for a period of 145 minutes, were destroyed within 10 to 15 minutes when a 0.1 per cent formaldehyde solution was allowed to act simultaneously with the steam. Similar results were obtained in experiments with anthrax spores. Attention is called to the fact that by the use of a combination of steam and formaldehyde it is possible to destroy the most resistant spores at a temperature which is harmless for substances such as leather, silk, etc.

The parasites of man and domestic animals, E. PERRONCITO (*I parassiti dell 'uomo e degli animali utili. Milan: Francesco Vallardi, 1901, pp. 632, pls. 25, figs. 276*).—A brief account is given of parasitism in general with notes on the pathogenic bacteria of greatest importance. The greater part of the volume is occupied with a discussion of animal parasites, the diseases caused by them, and methods of prevention and cure of infestation by these parasites. Animal parasites are discussed in a systematic manner according to their position in the usual scheme of zoological classification. The groups which are discussed include protozoa of various families, tapeworms, fluke worms, nematodes, mites, insects, etc. The more important species are illustrated and reference to the various subjects is made easy by means of a subject and author index.

The dry-rot fungus, a pathogenic parasite of man and animals, with special regard to its action in causing cancerous tumors, A. KLUG (*Der Hausschwamm ein pathogener Parasit des menschlichen und tierischen Organismus, speziell seine Eigenschaft als Erreger von Krebsgeschwülsten. Freiheit-Johannisbad: Author, 1903, pp. 139, figs. 44*).—An elaborate investigation was made for the purpose of determining the relationship between *Merulius lacrymans* and cancerous tumors in man and animals. A large number of cancerous growths of various forms were studied in human patients and the spores of this fungus were found in the tumerous growths. Experiments were made in inoculating rabbits, 15 of these animals being used during the progress of the investigation. All of the rabbits were killed within from 14 to 240 days after inoculation and were subjected to careful post-mortem examination. It was found as a result of these experiments that the dry rot fungus is capable of living as a parasite in animal tissue and that the meruliocytes obtained from tumors thus produced were identical with those obtained from the germination of basidiospores of the dry-rot fungus.

Observations on the flagella of the tetanus bacillus, S. DE GRANDI (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), No. 2, Orig., pp. 97–108, figs. 11*).—A detailed description is given of the flagella of the tetanus bacillus as they appear after treatment by various staining methods, and notes are presented on the microscopic technique which is required for demonstrating the flagella.

A means of preventing tetanus, E. THIERRY (*Jour. Agr. Prat., n. ser., 6 (1903), No. 27, pp. 23, 24*).—It was found that the antitetanic serum could be desiccated to the form of a powder and that its active properties could be preserved in this form for a long period.

A short historical report on the veterinary service from 1898 to 1903 and on the veterinary sanitation in St. Petersburg, S. I. SAMBORSKI (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 4, pp. 417–442*).—In this article the author presents an account of the organization of veterinary service and sanitation in St. Petersburg, with special reference to the prevention of the spread of animal diseases to man through the uncontrolled prevalence of animal plagues and through the use of the meat and milk of diseased animals.

Division of veterinary science, J. A. GILRUTH (*New Zealand Dept. Agr. Rpt. 1902, pp. 219–326, pls. 25, figs. 7*).—A short account is given of the equipment of the laboratory of the bacteriologist and on the work done in this laboratory during the

season. The author discusses the slaughtering and inspection act of New Zealand and describes a number of abattoirs and the methods of slaughtering and inspecting meat. Notes are given on the condition of horses selected for military service and on the chief defects found in these animals. The author advocates the compulsory registry of all veterinary practitioners in the Colony.

During the year three outbreaks of anthrax occurred at widely separated localities. It is feared that unless special care is exercised to prevent the further introduction of anthrax in bones used for fertilizing purposes and otherwise New Zealand will become extensively infested with this disease.

The total number of cattle inspected during the year was 80,987, and of this number 3,919, or 4.8 per cent, were found to be tuberculous. This percentage of tuberculosis was found among cattle which had never been stabled or handled, and indicates the possibility of the spread of the disease under range conditions. Notes are given on tuberculosis of the larynx in cattle and on tuberculosis in fowls. A number of outbreaks of the latter kind was observed during the year. Considerable loss was suffered from abortion, and this was believed to be of a contagious nature in every case and not due to ergot.

Hog cholera had not been observed for a year, but broke out again under conditions which precluded a knowledge of the source of infection. Notes are given on blackleg and pseudotuberculosis in sheep. The pathological anatomy and symptoms of pseudotuberculosis are described in detail, and an organism was isolated with which inoculation experiments were made in sheep, guinea pigs, rabbits, and calves. The disease affects all these animals and also goats. In its pathology the disease resembles tuberculosis and glanders.

An outbreak of a disease resembling braxy occurred among sheep which were fed on turnips. Post-mortem examinations were made, and the symptoms and lesions of the disease are described. An organism was isolated from diseased animals and inoculation experiments were made on sheep and guinea pigs. The disease is apparently due to a specific micro-organism which differs from any other previously observed by the author. The chief symptoms of braxy are not present. There is no striking odor immediately after death, and very little gas in the cultures of the bacilli.

A form of gangrenous mammitis was observed in sheep. It proved to be contagious and due to a specific micro-organism. No curative treatment was successful. Notes are given on a number of parasites of sheep, including lung and stomach worms, botflies, tapeworms, liver flukes, *Cœnurus cerebralis*, etc. The predisposing causes of infestation by these parasites are considered to be the following: Drinking stagnant water; constitutional weakness of the sheep; presence of the parasites in swampy, undrained lands; want of care in weaning; overstocking, and insufficient nutrition. Experiments with intratracheal injections of carbolic acid, turpentine, chloroform, olive oil, and doses of turpentine and oil indicated that these remedies are of little use.

The author believes that the most rational method of prevention and cure for the lung and stomach worms consists in the provision of a generous diet. Cirrhosis of the liver in horses and cattle was investigated by the author, and was found to be connected in some way with the ingestion of *Senecio jacobæus*. The disease appeared only in animals which had eaten this plant. Notes are also given on a number of diseases, including among others the following: Omphalitis in colts, paralysis in salmon and trout, epithelioma of salmon, septic pleurisy in sheep, actinomycosis and a considerable variety of tumors in domesticated animals.

Semiannual report of the chief of the cattle bureau, A. Peters (*Massachusetts State Bd. Agr. Rpt. 1902, pp. 321–378*).—As usual in these reports, the author presents a financial statement showing the expenses of the cattle bureau in the work of eradicating infectious diseases, the payment of indemnities for animals, etc. A large number of tuberculin tests were made for the purpose of determining the extent

of tuberculosis in the State. During the progress of this work 898 cattle were condemned, killed, and indemnities paid to the owners. A few experiments were made bearing upon the question of identity of human and bovine tuberculosis. These experiments were made by Dr. Theobald Smith. Four young cattle were inoculated with tubercle bacilli of human and bovine origin. The autopsies indicated that the disease in the animals which were inoculated by bacilli of apparently bovine origin was much more virulent than in the others. The experiments, while not completed, indicated that the disease in children from which tubercle bacilli were obtained was of bovine origin. A number of cases of actinomycosis is reported.

An elaborate review is recorded of the outbreak of the foot-and-mouth disease which has recently prevailed in Massachusetts and neighboring States. In the warfare which was waged for the eradication of this plague the Massachusetts cattle bureau cooperated with this Department. Copies are presented of the various orders which were issued by the cattle bureau and by the Bureau of Animal Industry. The number of animals killed by the Bureau of Animal Industry was 1,848, and the indemnity paid for these animals was $62,050.25. This indemity was estimated at 70 per cent of the value of the cattle killed. A few cases of Texas fever occurred at Wellesley, the animals having been imported from Michigan. No outbreak of anthrax was reported, but a few cases of blackleg occurred.

Considerable attention is devoted to a discussion of the problem of glanders in Massachusetts. This disease appears to be on the increase in spite of all the efforts which are being put forth to control it. It is estimated that the annual loss in the State from this disease is about $60,000. The total number of cases on record is 1,027, which is an increase of more than 100 over the number reported for the previous year. Mallein has been used more extensively than ever in the identification of the disease. Brief notes are also presented on contagious diseases of swine, nodular disease of sheep, stomach worms in sheep, and rabies.

Governmental protection against animal plagues, B. Plehn (*Der staatliche Schutz gegen Viehseuchen. Berlin: August Hirschwald, 1903, pp. 549*).—In this volume the author has brought together copies of German laws and regulations regarding the control and eradication of rinderpest, swine plague, influenza of horses, and other dangerous contagious diseases of domesticated animals, together with a discussion of the importance and effects of these laws. Reference to the various subjects discussed in the laws is made easy by the addition of a detailed index. In an appendix to the volume, Froehner gives an account of the nature, symptoms, and treatment of the various diseases mentioned in the German laws.

Some diseases of cattle, C. A. Cary and F. G. Matthews (*Alabama College Sta. Bul. 125, pp. 105–168, figs. 15*).—Notes are given on the nature, symptoms, and economic importance of cow pox, varicella, furunculosis, obstructions to the flow of milk, dysentery in young animals, acute indigestion in cattle, abortion, milk fever, and mammitis. Feeding experiments were made with *Kalmia latifolia*. A cow, a calf, and one horse were fed various quantities of the leaves of this plant, and all of the animals manifested decided symptoms of poisoning. The symptoms included an increase in the rate of pulse and respiration, together with disturbances of temperature and muscular convulsion. Whisky is recommended as a stimulant in cases of poisoning from this plant, and Epsom salts as a purgative. Similar symptoms were produced as a result of eating the leaves of *Æsculus pavia*. Brief notes are given on poisonous plants which contain hydrocyanic acid. These plants include various species of the genus Prunus, as well as sorghum. A number of cases of poisoning are reported from Alabama. *Phytolacca decandra* is said to produce symptoms of poisoning, which include chills, fever, and headache. When applied to the skin a decoction of this plant acted as a blister.

Extensive experiments in the antiseptic treatment of aborting cows indicated that this method is of little avail in the control of abortion. It is suggested that the bac-

terial organism which causes the disease is located in the uterus as well as in the vagina, and that therefore the ordinary antiseptic washes are insufficient for destroying infection. It is suggested that the expensive method of gradually establishing immunity in a herd of cattle may in the end be the cheapest method of controlling this disease.

Studies on natural and artificial immunity to anthrax, O. BAIL and A. PETTERSSON (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), Nos. 5, Orig., pp. 343–353; 8, Orig., pp. 610–612; 10, Orig., pp. 756–762; 34 (1903), No. 2, Orig., pp. 167–170*).—An elaborate study was made of the reactions observed in the blood of different animals to infection with anthrax. Special attention was given to the study of the antagonistic action of rabbit and dog serum toward anthrax bacillus. Notes are given on the location of the complement in the body of rabbits. As a result of experiments carried on by the authors it was found that the mere power of the serum to undergo an increase in its immunizing properties by the addition of normal rabbit serum containing some complement has no apparent connection with natural immunity to anthrax on the part of the animal from which the blood was obtained. A test was made to determine whether the serum of various animals could be fortified by the addition of leucocytes and tissue cells from rabbits. In these experiments it was found that the organs of rabbits from which the blood had been removed exercised no influence in an indifferent fluid upon anthrax bacilli. The authors believe, therefore, that the immune body and the complement do not exist simultaneously in rabbits, or at least not to a high degree. The property of fortifying the sera of other animals appears to exist chiefly in the blood and to a less degree in the polynuclear leucocytes. A study was also made of the reaction of horse and rat sera to anthrax bacilli, and of the quantity of immune body in the normal sera of different animals.

Anthrax, A. R. WARD (*California Sta. Circ. 4, pp. 3*).—Brief notes on the symptoms and post-mortem appearances of this disease, with an account of vaccination.

Blackleg, A. R. WARD (*California Sta. Circ. 2, pp. 3*).—Brief notes on the symptoms, post-mortem changes, etiology, treatment, and vaccination for this disease.

The inoculability of human tuberculosis upon bovines, D. J. HAMILTON (*British Med. Jour., 1903, No. 2228, pp. 565, 566*).—This article is of a controversial nature and in it the author presents arguments in support of the correctness of the results obtained in his previous experiments, during which it was shown that cattle could be inoculated with tubercle bacilli of human origin.

The present warfare against tuberculosis of domesticated animals, O. MALM (*Norsk Vet. Tidsskr., 15 (1903), No. 2, pp. 33–75*).—In this article the author presents a summary account of the methods employed in combating bovine tuberculosis in Denmark, Norway, Sweden, Finland, Germany, and other parts of Europe, and the United States. The method of immunization recently proposed by Behring is critically discussed. The author concludes from his review of this subject that no system of immunization thus far suggested can be relied upon to give satisfactory results under ordinary conditions. It is recommended, therefore, that the warfare against bovine tuberculosis be continued along present lines, viz, by the extensive use of tuberculin and quarantining infected animals.

Foot-and-mouth disease, D. E. SALMON (*U. S. Dept. Agr. Yearbook 1902, pp. 643–658, fig. 1*).—The author presents a historical account of the recent outbreak of this disease in the United States. Notes are given on the distribution of the disease at various times during the outbreak, and on the measures which were adopted for controlling it. The disease was confined to Massachusetts, New Hampshire, Vermont, and Rhode Island, and affected 220 herds of cattle containing 4,175 animals. The total compensation paid by the Government as indemnity for slaughtered animals of all kinds was $120,007.47.

Foot-and-mouth disease, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 22 (1903), No. 6, pp. 681–684*).—The symptoms, cause, means of distribution, and treatment of

this disease are briefly discussed, with special reference to recent outbreaks of the disease.

Serum therapy in foot-and-mouth disease, E. NOCARD (*Jour. Agricole* [*Paris*], *14* (*1903*), *No. 161, pp. 137–141*).—This is a copy of the report made at a general agricultural congress in Paris. The method of applying this treatment is outlined and the advantages and disadvantages are mentioned. It is stated that the immunity persists for not longer than 15 days, and that at the end of that time the animals are as susceptible to the disease as before treatment.

The serotherapy of foot-and-mouth disease, E. NOCARD (*Bul. Agr. Algérie et Tunisie, 9* (*1903*), *No. 12, pp. 275–280*).—Brief notes are given on the successful application of serotherapy in the treatment of various diseases of animals and man. In the treatment of foot-and-mouth disease the results from the use of serum have been much less satisfactory, but the author believes that a more lasting immunity will ultimately be produced by this method.

Report on the cattle disease in southern Rhodesia, R. KOCH (*Agr. Jour. and Min. Rec.* [*Natal*], *6* (*1903*), *Nos. 10, pp. 313–319; 12, pp. 401–405*).—A careful investigation of the virulent form of Texas fever, or redwater, which has long been known in Rhodesia, led the author to the conclusion that this disease, while closely related to Texas fever, is quite distinct from it.

The author observed a number of constant differences between Texas fever and the form of the disease which prevails in Rhodesia. In the latter form of the disease the red blood corpuscles are more abundantly infected with the blood parasites, but the destruction of the blood corpuscles is very slight as compared with that which is observed in cases of Texas fever. It was only in a few instances that the number of red blood corpuscles per cubic millimeter was reduced to 4,500,000.

An examination of animals dead of the Rhodesian fever discloses certain post-mortem changes which are absent in cases of Texas fever. These changes consist in lesions in certain organs which indicate that parasites become accumulated in these parts in enormous numbers. In a number of cases it was possible to determine definitely that the animals were simultanously affected with Texas fever and Rhodesian fever. The small parasites of the Rhodesian, or African Coast fever, as the author calls it, were present in the blood, together with larger pyriform organisms of Texas fever.

Another striking difference between Texas fever and Rhodesian fever was observed in the fact that direct inoculation of healthy animals with the blood of animals affected with Rhodesian fever does not produce infection from the first inoculation but only after a second inoculation. It was observed that the animals which were immune to Texas fever were very subject to Rhodesian fever, but it was found possible to produce immunity to the Rhodesian form of the disease by inoculation with the blood of animals infected by this form.

The cattle disease in southern Rhodesia, R. KOCH (*Transvaal Agr. Jour., 1* (*1903*), *No. 4, pp. 112–117*).—A circumstantial account is given of the conditions which prevail in the infested territory. The symptoms of the Rhodesian tick fever are said to be very similar to those of Texas fever. The rate of mortality is very high, in some outbreaks 80 to 90 per cent. The blood parasites are considerably smaller than in the case of Texas fever and in the early stages of the disease are not very numerous. The destruction of red corpuscles is by no means so great as in Texas fever. There is therefore a much less pronounced anemia than is usually observed in Texas fever. Extensive experiments have been planned for the purpose of developing a successful method of inoculation and the author hopes for satisfactory results from these experiments.

The Rhodesian tick fever, A. THEILER (*Transvaal Agr. Jour., 1* (*1903*), *No. 4, pp. 93–110, pl. 1*).—The name "Rhodesian tick fever" is proposed to differentiate this form of protozoan disease from the less malignant Texas fever of the United

States. A historical account is given of the occurrence and distribution of the disease in South Africa. The organism of the disease is a species of pyroplasma closely related to that of Texas fever and exhibiting bacillary and coccal forms. The organism was readily found in the blood of infected animals. The shortest period of incubation observed was 10 days and the longest 20 days. The average course of the fever occupied about 13 days, and the period from infection to death about 25 days. The symptoms and post-mortem lesions are described in detail and notes are given on the history of various cases and on extensive inoculation experiments with the blood of affected animals. The tick which is believed to be instrumental in carrying the disease is *Rhipicephalus shipleyi*, commonly known as the brown tick. Inoculation experiments were unsuccessful on account of the fact that under ordinary circumstances the blood of affected animals does not produce the disease when inoculated into healthy ones. In a few instances it was observed that animals which had recovered from one attack of Rhodesian tick fever were still susceptible to the disease.

The new form of redwater in the Transvaal, D. HUTCHEON (*Transvaal Agr. Jour., 1 (1903), No. 3, pp. 45–57*).—A brief account is presented of the work of Koch and Theiler on this subject. Notes are also given on the history of the disease in Rhodesia and the Transvaal. The disease is undoubtedly carried by ticks and the author recommends quarantining known infected centers and the use of an arsenical dip for the destruction of ticks. While little good can be expected from the use of drugs in the treatment of this disease, fairly satisfactory results have been observed by the author in a number of cases from the use of carbolic acid and certain coal-tar derivatives. Carbolic acid was given, thoroughly mixed with raw linseed oil. Attention is called to the failure which has attended attempts to immunize cattle by inoculation with the blood of animals recovered from Texas fever. It is necessary to use blood from animals recovered from the more virulent form of the disease which prevails in South Africa.

Rinderpest and redwater in cattle, S. STOCKMAN (*Transvaal Agr. Jour., 1 (1903), No. 4, pp. 59–63*).—The author conducted an elaborate series of experiments for the purpose of determining whether animals could be infected with these 2 diseases simultaneously and whether the lesions caused by the 2 diseases could be readily distinguished. As a result of these investigations it was found that animals are frequently attacked by both diseases at the same time, and that the extensive intestinal lesions which had been attributed by some writers to an attack of redwater were really the result of infection by rinderpest. During experiments made by the author in the production of rinderpest serum a number of animals was inoculated with the virus of rinderpest and one of these animals developed redwater in addition to rinderpest. Inoculation of other animals with the blood of these animals produced rinderpest only in animals which were immune to redwater, while both diseases developed in animals which were susceptible to both. The author concludes from his experiments that the possible coexistence of rinderpest and redwater must be admitted, and that this fact should be borne in mind in experiments with rinderpest serum, or in inoculation experiments for the purpose of preventing redwater.

Redwater inoculation, L. D. GILSON (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 10, pp. 310–312*).—Excellent results are reported from inoculation experiments during which the defibrinated blood of diseased animals was used for inoculating susceptible animals.

Virulent redwater in the Transvaal, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 23 (1903), No. 1, pp. 39–60*).—The author presents a detailed report of his investigations regarding the history, distribution, cause, nature, and treatment of the virulent form of Texas fever observed in the Transvaal. It is believed that this disease is identical with that reported in Rhodesia. The author observed that cattle which had been immunized against Texas fever were still subject to the virulent

form of the disease prevailing in the Transvaal. It is believed, however, that healthy animals may be successfully immunized against the virulent form of the disease, by using blood of animals which have recovered from this disease, under the usual precautions which are recognized as necessary to the success of such inoculation experiments.

Rinderpest in Cape Colony (*Agr. Jour. Cape Good Hope, 23 (1903), No. 1, pp. 70–82, pls. 5*).—This article deals chiefly with an account of the serum station at Aliwal North. Two extensive outbreaks of rinderpest have occurred in Cape Colony and the disease has been stamped out in both instances with considerable rapidity by inoculation of healthy animals with the serum or bile of recovered or diseased animals. Detailed notes are given on the methods employed at the Aliwal North station in preparing serum and bile, and of the treatment and management of infected herds.

A note on tick infestation, C. P. LOUNSBURY (*Transvaal Agr. Jour., 1 (1903), No. 4, pp. 11, 12*).—Experiments are in progress to determine the species of ticks which are concerned in carrying the virulent form of Texas fever which prevails in South Africa. According to determinations made by G. Neumann, *Rhipicephalus shipleyi* and *R. simus* are instrumental in carrying this disease. The author believes, however, that these determinations are only preliminary and may be shown to be incorrect after a larger amount of material is examined.

A bacterial form of bovine piroplasmosis, A. LAVERAN (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 11, pp. 648–653, figs. 18*).—The bacterial form of *Piroplasma bigeminum* was sent from Rhodesia to the author by Theiler. This organism is described in detail and notes are given on its prevalence in the cases of Texas fever which have recently been investigated in Rhodesia. The form of Texas fever which prevails there is unusually virulent. The organism is considered as a variety of the ordinary specific form. The possibility is suggested of this being a new species of piroplasma and the suggestion is based on the fact of its unusual virulence and peculiar symptoms manifested in affected cattle.

Spirillosis in Bovidæ, A. LAVERAN (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 16, pp. 939–941, fig. 1*).—A species of Spirillum was found in the blood of cattle in the Transvaal. The author describes this organism in detail. The cattle in which the organism was found were also affected with Texas fever and the pathogenic action of the Spirillum therefore remains doubtful.

Lamziekte and impaction of the third stomach, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 23 (1903), No. 1, pp. 25–28*).—Lamziekte is described as a lameness or nervous affection in cattle which may be due to congestion of the liver. The symptoms of the disease are described in detail. Impaction of the third stomach is described with especial reference to the cause and treatment of this trouble.

Indigestion and diarrhea in calves, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 22 (1903), No. 6, pp. 669–681*).—The author describes in detail the symptoms, etiology, and treatment of diarrhea due to sudden changes of diet or to intestinal parasites, as well as infectious diarrhea or so-called white scour in calves. A brief discussion is also presented on the subject of liver disease in calves.

Contagious abortion in cows, J. LAW (*California Sta. Circ. 5, pp. 13*).—A popular account of the forms of abortion, together with a discussion of the etiology, symptoms, prevention, and treatment of this disease.

Sterility in cattle and sheep (*Agr. Jour. Cape Good Hope, 22 (1903), No. 6, pp. 658–661*).—A brief discussion is given on the possible action of salt in causing sterility. It is not believed that any such effect can be produced by salt under ordinary conditions. Brief notes are also given on the veterinary use of Stockholm tar.

Plants injurious to stock, C. W. PETERSON (*Rpt. Dept. Agr. Northwest Territories, 1902, pp. 33–44*).—Notes are given on *Pulsatilla hirsutissima*, spear grass, common horsetail, oat smut, ergot, larkspur, corn cockle, Thermopsis, lupines, loco weed, chokecherry, water hemlock, sneezeweed, death camas, *Solanum triflorum*, and

other plants which are known or suspected of having caused poisoning among cattle, sheep, and horses.

Loco weed, L. E. SAYRE (*Trans. Kansas Acad. Sci., 18 (1901–2), pp. 141–144*).—A number of experiments are reported in which feeding tests were made with *Astragalus mollissimus.* The plant was not found to be uniformly poisonous—in fact, in some instances, no effects whatever were produced by eating it. A brief account is given of the various theories which have been suggested in explanation of loco disease.

Rot in sheep (*Jour. Bd. Agr. [London], 10 (1903), No. 1, pp. 22–26, fig. 1*).—Brief notes on the life history of the liver fluke, together with an account of the symptoms of infestation by this worm, and a discussion of preventive and remedial measures.

Contagious gangrenous mammitis in sheep, J. A. GILRUTH (*New Zealand Dept. Agr. Leaflets for Farmers, No. 63, pp. 4*).—An investigation of this disease disclosed the fact that it is of an infectious nature and is caused by a specific organism of the Coccus type. Inoculation experiments showed that the disease could be transmitted through the milk sinus. No direct curative treatment is practical and the only method of controlling the disease consists in stamping out the infection and the use of preventive remedies.

Parasites in sheep, J. A. GILRUTH (*New Zealand Dept. Agr. Leaflets for Farmers, No. 64, pp. 10*).—Notes on stomach and lung worms, tapeworms, liver flukes, and other parasitic worms of sheep, together with a discussion of the predisposing factors of the infection by these worms and a brief statement of the remedies commonly recommended for destroying the pests.

Damaged wool and its relation to sheep dips, S. B. HOLLINGS (*Bradford, England: William Byles & Sons, 1903, pp. 15*).—The author made an extensive investigation of the relationship between sheep dips and damaged wool. These investigations covered the greater part of Europe, Australia, Tasmania, etc. It was found that as a rule the low prices paid for inferior grades of wool were due to injury from the use of certain dips. The lime and sulphur dip is condemned as always injurious. It was found to cause trouble in scouring, dyeing, and weaving of the wool. This dip is said to have been abandoned in Australia, Tasmania, the Argentine Republic, Ireland, and certain other sheep-raising countries.

Tobacco dips were found to stain the wool in a large percentage of cases, except where sheep were dipped immediately after shearing. Tobacco dips are objected to furthermore on the ground of injurious action upon the sheep. Carbolic dips, and especially pitch oil, formerly used in Scotland, are condemned as causing considerable injury to the wool staple, except when properly made. The author believes that arsenical dips are effective in curing scab, and his investigations indicate that these dips cause the least injury to wool when properly prepared and applied. If, however, an excess of either alkali or arsenic be present in the dip as a result of careless preparation or inaccurate measurements of ingredients, great harm results to the wool.

The author recommends that no home-made arsenical or carbolic dips be used, on account of the careless methods which are so frequently observed on farms and ranches. On the other hand, arsenical dips, when accurately made, so as to avoid any excess of either alkali or arsenic, are recommended as safe and as least liable of all dips to cause serious harm to the color or structure of the wool fiber.

Takosis, a contagious disease of goats, J. R. MOHLER and H. J. WASHBURN (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 45, pp. 44, pls. 5*).—An extensive outbreak of an apparently new disease occurred among Angora goats in Pennsylvania during December, 1901, and was investigated by the authors. While the common goat is comparatively refractory to ordinary diseases, the authors believe that the

Angora has developed "a perceptible retrogradation in vitality and power of resistance against diseases."

An outbreak occurred on premises where goats had been maintained for a number of years, but the greater part of the flock had recently been purchased in Texas. The symptoms of the disease were great emaciation and weakness, combined with diarrhea, pneumonia, and a considerable elevation of temperature. Rumination continued and the appetite persisted fairly good. The disease assumed either a subacute or chronic type, and its course varied from 8 days to 6 or 8 weeks. Young goats appeared to be most susceptible. The visible mucous membranes are pale in cases of this disease, and the lungs exhibit an extensive inflammation. The heart is pale and shows inflamed areas. The spleen is somewhat atrophied.

Cultures made from the heart, lungs, spleen, liver, and mediastinal lymphatic glands showed the presence of a new organism, which is described under the name *Micrococcus caprinus.* It occurs either singly or in chains of 2, 3, or 4 elements. No capsules were observed on the organism. This organism develops as an aerobe, but may also occur under anaerobic conditions. The growth of the organism on various culture media is described in detail. It did not produce gas, and the indol test gave negative results. The organism was killed by exposure for 6 minutes at a temperature of 62° C. and desiccation for 12 hours, and subsequent exposure to diffuse light for 9 days, destroyed its virulence. Low temperatures had no effect upon the organism. It was killed, however, by exposure for 26 minutes to a solution of bichlorid of mercury in the proportion of 1 to 2,000, or for 57 minutes to a 1 per cent solution of carbolic acid, or for 31 minutes to a 2 per cent solution of formalin. Inoculation experiments showed that the organism was pathogenic for goats, chickens, rabbits, guinea pigs, and white mice, but not for sheep, dogs, or rats.

A toxin was obtained from cultures of the pathogenic organism, which was destroyed by subjection to heat, but which, when inoculated without being subjected to heat, produced considerable immunity in the animals thus treated. The number of red blood corpuscles was not diminished during the progress of the disease. Medicinal treatment was as a rule unsatisfactory, but in certain cases encouraging results were obtained from the administration of calomel, followed by powders containing arsenic, iron, and quinine. The authors believe that the method of immunization devised by them will give good results on a large scale when further perfected.

Hog cholera, A. R. WARD (*California Sta. Circ. 3, pp. 6*).—A short account of the symptoms, methods of distribution, treatment, and quarantine regulations for hog cholera.

Glanders in the camel under conditions of natural and artificial infection, A. P. PETROVSKI (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), Nos. 2, pp. 103–150; 3, pp. 274–295; 4, pp. 383–416; 5, pp. 511–539*).—The eradication of glanders among camels is an important economic problem in certain parts of the Russian Empire on account of the large numbers of camels which are raised and the considerable percentage of infection with glanders. The author made an extended investigation of the conditions under which natural infection takes place in camels, and conducted a number of experiments in artificial infection for the purpose of determining the susceptibility of camels to the disease, and the possibility of protecting them by means of repeated injections of mallein and serum of glanderous horses. The experiments have thus far not led to results which can serve as a practical working basis regarding the treatment of glanders.

Experiments in the treatment of glanders, and immunization of cats and guinea pigs against this disease, M. LAVINOVICH (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 3, pp. 211–226*).—The author discusses the subject of the treatment of glanders, in connection with a bibliography of 34 titles. The experiments reported by the author indicate that a considerable degree of immunization may be conferred upon cats and guinea pigs by repeated injections of the serum from glanderous ani-

mals. The author believes that the methods which he employed may be extended to the treatment of horse and man for the same disease.

Disinfection of stables in cases of glanders, A. THEILER (*Transvaal Agr. Jour., 1 (1903), No. 3, pp. 16, 17*).—The recommendations offered by the author include the immediate isolation and quarantine of glanderous horses, the thorough cleaning and disinfection, by burning and the use of various antiseptic substances, of all bedding, harness, stalls, and utensils which may have become infected from the glanderous animals.

Contagious skin diseases of the horse, A. THEILER (*Transvaal Agr. Jour., 1 (1903), No. 3, pp. 14–16*).—Notes on Sarcoptes, Dermatocoptes, and Dermatophagus as causes of different kinds of mange in horses. The remedies recommended for the treatment of mangy horses include carbolic acid, creolin, benzine, kerosene, tar, tobacco, sulphur, etc.

Post-mortem diagnosis of rabies according to the method of Nélis, A. V. BYELITZER (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), Nos. 4, pp. 347–382; 5, pp. 463–492, figs. 3*).—During the experiments recorded in this paper, the author found that by the method of Nélis it is possible to make a rapid diagnosis of rabies in dogs in all cases of natural death from this disease and in the majority of cases in which the animals were killed during the progress of the disease. In horses, cattle, sheep, and hogs dead of rabies the changes in the ganglion nodosum, although sufficiently conspicuous to permit a diagnosis, are of less importance than they are in dogs. A post-mortem diagnosis of the early stages of rabies in the larger domesticated animals from an examination of the ganglion nodosum is exceedingly difficult. The superior cervical ganglion is commonly affected in rabies less extensively than the ganglion nodosum, although the changes in it are identical with those which occur in the latter. The alterations in the nerve ganglia in cases of rabies do not begin with a proliferation of the endothelial capsule of the nerve cells, but with an infiltration of cellular elements of connective tissue. The author believes that all positive results obtained in examination of supposed cases of rabies according to the method of Nélis may be confidently relied upon.

Experimental investigations in the diagnosis of rabies, A. AUJESZKY (*Veterinarius, 25 (1902), No. 18, pp. 550–554*).—The author made a study of the brain of 63 animals and 1 man suspected of being infected with rabies. Of the 64 cases, the investigation was without results in 12, while in 10 it was shown that the animals were not affected with rabies. The incubation period in the 42 cases in which positive results were obtained averaged 16 days after subdural inoculation and 19 days after intramuscular inoculation. The course of the disease after the appearances of pronounced symptoms was from 3 to 6 days. It was shown during these experiments that subdural inoculation is much more certain than intramuscular.

Trichorrhexis nodosa, with special regard to its etiology and treatment, TENNERT (*Ztschr. Veterinärk., 14 (1902), No. 8–9, pp. 361–372, figs. 5*).—The literature of this subject is reviewed in connection with a brief bibliography. The author believes that the name of this disease has been used incorrectly in many instances in cases of other closely related skin diseases. Detailed notes are given on the pathological anatomy of the disease and on the symptoms by which it may be recognized. The disease is due to the attacks of a micro-organism similar to that which produces favus.

Some diseases of poultry in South Africa, HUNEBERG (*Transvaal Agr. Jour., 1 (1903), No. 4, pp. 65–67*).—Serious digestive disturbances are said to occur in fowls after excessive feeding with corn or fermented cereals. Notes are also given on roup, gapes, and eye diseases in young chickens.

An epizootic among ducks with diphtheria bacilli upon the conjunctiva, KAMPMANN ET AL. (*Centbl. Bakt. u. Par., 1 Abt., 34 (1903), No. 3, Orig., pp. 214–[illegible]*).—A report is made upon an outbreak of an apparently new disease among ducks. This

disease affected a large number of ducks and was fatal in about 25 per cent of cases. One of the more characteristic symptoms of the disease was an intense conjunctivitis with the formation of a purulent discharge. An organism was isolated from the material obtained from the eyes of affected ducks and it was found to resemble closely the diphtheria bacillus. Notes are given on the growth of this organism on various nutrient media. Inoculation experiments with white mice and other experimental animals were without positive results.

The chicken mite, J. J. Repp (*Iowa Sta. Bul. 69, pp. 285–294, figs. 2*).—*Dermanyssus gallinæ* is said to be one of the most formidable enemies of chickens in Iowa. Sitting hens often die on the nest from excessive infestation with this mite, and a mortality as high as 90 per cent is reported in young chicks. The mite is described in its various stages. The author tried experiments in ridding henhouses by means of fire applied with a torch. The attempt, however, was unsuccessful, since it is impossible to apply sufficient heat to kill the mites without running the risk of setting the henhouse on fire. The best results were obtained from spraying with kerosene emulsion diluted with 10 volumes soft water. Three applications should be made in succession on the same day. After 2 or 3 days, when the eggs have hatched, another crop of mites will appear and the spraying should be repeated. The extermination of the mites may be hastened by dusting the fowls with pyrethrum powder while the spraying experiments are going on. Incidentally it was observed that all of the eggs of the chicken mite which are moistened by the kerosene emulsion are killed by this insecticide.

The fowl tick, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 23 (1903), No. 3, pp. 261–273, pls. 3*).—The fowl tick of South Africa is *Argas persicus*. The author worked out anew the details of the life history of this pest and describes the tick in its various stages. All stages of the tick were found to be capable of living many weeks without food or drink. The tick infests chickens, ducks, geese, and turkeys, and is believed to cause more serious depredations than has been supposed. The remedies recommended for controlling the tick include destruction by insecticides applied to infested birds, insecticide methods applied to roosts and to poultry houses, and isolation of roosts and nests by means of special methods of construction or by the use of repellants.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pts. 3, pp. 199–324; 4, pp. 325–403; 5, pp. 404–435*).—An alphabetical list of authors whose names begin with the letters C, D, and E.

Bibliotheca veterinaria, R. Klee (*Leipzig: Hermann Seemann Nachfolger, 1901, pp. 247*).—In this volume the author has made an attempt to present a list of veterinary works produced in Germany, either in a book form or in periodicals, up to the present time. The list is arranged alphabetically according to authors, and the volume is provided with an alphabetical list of important catchwords with references to the main text of the book.

AGRICULTURAL ENGINEERING.

Some engineering features of drainage, C. G. Elliott (*U. S. Dept. Agr. Yearbook, 1902, pp. 231–244, pl. 1, figs. 2*).—A discussion of some general features of drainage illustrated by plans made by the author for the drainage of lands near Greeley, Colo., swamped by excessive irrigation. "Sufficient work has been done in Colorado to demonstrate that judicious drainage will reclaim lands already saturated; that it will prevent the rise of alkali, and that land which has become water-logged and injured by alkali may by this means be restored to its former productiveness."

Drainage of irrigated land, E. McCullough (*Engineer. News, 50 (1903), No. 8,

pp. 158–160).—Referring to the work of this Department the author discusses the need and methods of drainage to relieve the land of excess of alkali and water.

The proper disposal of sewerage wastes in rural districts so as to prevent the spread of intestinal parasitic diseases, J. NELSON (*New Jersey Stas. Bul. 166, p. 15*).—This bulletin discusses sewerage and earth-closet systems of sewage disposal, kinds of sewage wastes, decomposition of sewage as a natural method of disposal, bacterial parasites, how disease germs are spread, the biology of parasitism, prevention of dissemination of parasitic germs, cesspool *v.* sewer gas, disease caused by improper disposal, and the proper construction of an earth closet.

The irrigation commission's report, C. SCOTT-MONCRIEFF ET AL. (*Indian Agr., 28* (*1903*), *No. 9, pp. 277–280*).—The concluding chapter, which summarizes this report, is quoted. The report describes "the present state and the extent of irrigation in India, its use and value in increasing the produce of the land and in affording protection against famine, the scope that still remains for its future expansion, both by public and private works, and the limitations to such expansion which are imposed by physical and financial considerations . . . [as well] as the possibility of utilizing artesian sources of supply, the classification and financing of State irrigation works, the provision of the additional establishment required for their construction and subsequent maintenance, the methods of charging for canal water, the value of agricultural experiments in connection with practical irrigation, and the future preparation and maintenance of programmes of famine relief works."

After considering the present status and future extension of large and small State works, private works are taken up and it is shown that "out of a gross area of 44 million acres annually irrigated in British India 25½ millions, or 58 per cent, are irrigated by private works." It is maintained that as great an increase in the irrigated area may be effected "by assisting and stimulating the development of private works as by constructing new State works. For greater protection against famine reliance must be placed, not only on new State irrigation works, but also on the extension of irrigation by means of private works. . . .

"The general geological conditions of India, and the results attained by the utilization of artesian waters in other countries where the conditions are more favorable, render it certain that the area which can be irrigated from these sources must always be comparatively insignificant." Programmes of relief works are outlined and administrative measures required are discussed.

Practical irrigation a success in Florida (*Forestry and Irrig., 9* (*1903*), *No. 9, pp. 435–442, figs. 3*).—"The districts in which irrigation is practiced are widely scattered. Commencing in the extreme northwestern portion, they extend through the central part, with numerous areas on the east and Gulf coasts. In northwest Florida irrigation is applied in the growing of Sumatra tobacco, while in other sections it is utilized in the cultivation of truck and small-fruit farms, orange groves, pineries, and nurseries. The water for irrigation is obtained from streams, lakes, and nonflowing wells, by various pumping devices, or from artesian wells having a strong surface flow. . . .

"In 1902 irrigation was reported from 405 farms, the irrigated area being 3,772 acres and the irrigation systems representing a constructive outlay of $512,859. The total artificially watered area producing crops was 3,313 acres and the value of the crops grown thereon was $1,432,530, an average of $432 per acre. The irrigation systems cost $446,569, an average of $135 per acre. There were 56 farms, having an irrigated area of 459 acres, which did not produce crops in 1902, the land being in young orange trees. The cost of constructing irrigation systems supplying these farms was $66,290. There were also reported 25 irrigation plants, costing $26,658, that were not operated in 1902."

Irrigation at Bundaberg (*Queensland Agr. Jour., 12* (*1903*), *No. 6, pp. 373–384,*

pls. 9).—A report of an irrigation reconnoissance of this district of Queensland, showing present status and possibilities of future development.

The use of alkaline and saline waters for irrigation, T. H. MEANS (*U. S. Dept. Agr., Bureau of Soils Circ. 10, pp. 4*).—Observations are reported which show that in the Algerian oases artesian water containing as high as 800 parts of soluble salts (largely sodium chlorid) per 100,000 is successfully used in the irrigation, not only of dates, but also of deciduous fruits, garden vegetables, and alfalfa. Accumulation of alkali in the soil is prevented by frequent and large applications of water. Analyses of 3 samples of the artesian water are reported.

The water supply of Australia, W. G. COX (*Proc. Roy. Colon. Inst., 33 (1901–2), pp. 35–49*).—In summing up the author states "that, as regards rainfall, Australia is similarly conditioned to other semitropical and tropical countries; that, as regards irrigation from rivers, the Darling-Murray system—which never runs dry—affords the best promise of future success; that the other rivers, and the creeks of the great plains of the interior, are not so well adapted for irrigation, unless at a cost for conservation reservoirs, which will be, in all probability, prohibitive for a long time to come; that, as regards subterranean supplies, the official figures given show the great present outflow, the bulk of which has been running continuously for years—in one State alone; and when the enormous quantity of water stored up in the ground at disposal is considered, and that that water is being tapped at a comparatively low cost for its value, and that it can be obtained in self-discharging quantities at any point required within the artesian areas, thus obviating expensive pumping from rivers or reservoirs and long-distance channeling, it is . . . . fair to claim that Australia can not be deemed . . . . a drought-stricken land. In the near future, when a much larger flow is obtained from artesian sources, the effects of droughts will be further neutralized."

Use of mineral oil in road improvement, J. W. ABBOTT (*U. S. Dept. Agr. Yearbook 1902, pp. 439–454, pls. 3, figs. 4*).—Experience in California is described, the general applicability of the use of oil is discussed, and methods are described. The use of oil is said to be applicable wherever "through long, hot, dry summers the roads become very dusty, and where water can be kept out of their foundations in the winter, so that they will remain firm and not give way beneath the oiled surface in the spring."

Thrashing machinery in Russia, C. J. ZINTHEO (*Amer. Thresherman, 6 (1903), No. 5, p. 4, figs. 4*).—A brief account of primitive methods still largely in use, of the introduction of English machines, and of the chance for the introduction of American machinery.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1902 (*U. S. Dept. Agr. Yearbook 1902, pp. 912, pls. 87, figs. 62*).—The Yearbook for 1902, prepared on the same general plan as previous Yearbooks, includes the report of the Secretary on the operations of the Department during the year, 37 miscellaneous articles noted elsewhere, and an appendix consisting of the usual summary of information on various subjects of interest to the farmer.

Some practical results of experiment station work, W. H. BEAL (*U. S. Dept. Agr. Yearbook 1902, pp. 589–606*).—A large number of specific examples are given to show the character and extent of the influence of the experiment stations in the United States upon agricultural practice.

Systems of farm management in the United States, W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1902, pp. 343–364, figs. 4*).—The author describes types of farm management designated live-stock farming, grain and hay farming, and nonhumus farming, and discusses their distribution in the United States. Selected farms repre-

senting subtypes of live-stock farming are described. These include a general live-stock farm in Illinois, a dairy farm in Indiana, and a sheep farm in Ohio. "The study commenced in this paper will be continued, and publications showing the methods of management pursued on different types of farms in all the principal agricultural sections of the country are under consideration."

Statistics of the land-grant colleges and agricultural experiment stations in the United States for the year ended June 30, 1902 (*U. S. Dept. Agr., Office of Experiment Stations Bul. 128, pp. 38*).—These statistics relate to the courses of study at the agricultural colleges, number of students in attendance, value of permanent funds and equipment, revenues for the year, etc.; and the lines of work and publications of the experiment stations, their revenues, additions to equipment, and classification of expenditures for the fiscal year. The total number of experiment stations in the United States is 60, exclusive of substations, and of these 55 receive the benefit of the Hatch Act. The total income of the stations during 1902 was $1,328,847.37, of which $720,000 was received from the National Government. In addition to this, the Office of Experiment Stations had an appropriation of $139,000, including $12,000 each for the Alaska, Hawaii, and Porto Rico experiment stations, $20,000 for nutrition investigations, and $50,000 for irrigation investigations.

The stations employ 710 persons in the work of administration and inquiry, 364 of whom do more or less teaching in the colleges with which the stations are connected. During the year they published 373 annual reports and bulletins, which were supplied to over half a million addresses on the regular mailing lists.

Instruction in agronomy at some agricultural colleges, A. C. TRUE and D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Bul. 127, pp. 85, pls. 17, figs. 22*).—This bulletin contains a brief review of the work of the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, with extracts from the reports of that committee, and detailed descriptions of the courses in agronomy in the agricultural colleges in Alabama, Illinois, Michigan, Minnesota, Nebraska, and Ohio, and the agricultural institute of the University of Göttingen, Germany.

Progress in secondary education in agriculture, A. C. TRUE (*U. S. Dept. Agr. Yearbook 1902, pp. 481–500, pls. 2*).—This is a review of the progress that is being made in secondary education in agriculture in the United States. The present status of the high schools as regards industrial education is set forth, the schools of agriculture of the universities of Minnesota and Nebraska and the agricultural high schools in Wisconsin and other States are described, and suggestions are made for courses in agriculture in the public high schools.

The serious problem of obtaining teachers properly qualified to give instruction in agriculture in high schools is also considered, and the advantages to be derived from high school courses in agriculture are pointed out. "Technical education has proved a sure road to commercial development and greatly increased wealth in connection with every industry which has received its benefits. It will prove equally so as regards agriculture. The tremendously productive results which have already come from the work of the agricultural colleges and experiment stations may be multiplied a hundredfold by the education of hundreds of thousands of the flower of rural youth in secondary schools in which there is definite and systematic teaching of the technique and scientific principles of agriculture."

Primary commercial education in Germany, E. L. HARRIS (*U. S. Consular Rpts., 72 (1903), No. 273, pp. 190–199*).—Statistical information on this subject.

NOTES.

Connecticut State Station.—E. Monroe Bailey has been appointed assistant chemist.

Florida College and Station.—F. S. Stringer and F. M. Simonton have succeeded J. D. Callaway and L. Harrison on the governing board. F. C. Reimer has succeeded Miss Lucia McCulloch as assistant in botany; and W. E. Worthington has been appointed assistant in field and feeding experiments, and R. H. Lichtenthaeler second assistant chemist.

Hawaii Federal Station.—Jared G. Smith, director, has returned to Washington for a few weeks for conference on the work of the station.

Hawaii Sugar Station.—An additional laboratory building has been erected and equipped for analytical work on sugarhouse products. Firman Thompson, formerly of the Queensland Sugar Experiment Station, and A. E. Jordan have been added to the station staff as assistant chemists.

Idaho College and Station.—H. T. Condon has resigned as clerk of the station, and is succeeded by W. G. Harrison. It has been decided to add an agronomist to the station staff, to take up work in plant breeding and soil physics; and a bacteriological laboratory will soon be established in connection with the department of botany. A number of Shorthorn cattle will be purchased in the East to increase the present herd, the last legislature having made an appropriation of $3,000 for this purpose.

Illinois College.—The enrollment for the fall term includes a total of 290 students in the agricultural courses, an increase of more than 75 over last fall. The majority come better prepared this year and a larger number will take the four-year course. The graduating class this year will be as large, if not larger, than the entire number of agricultural students five years ago.

Iowa College and Station.—Thomas S. Hunt has been appointed assistant in field experiments to succeed Alfred Atkinson who resigned some months since to take up editorial work. Howard R. Watkins is now assistant in agricultural chemistry in the college. The new live-stock and grain-judging pavilion is nearing completion. The building is octagonal in form, 65 ft. in diameter, 2 stories high, and built of pressed brick, with steel girders and slate roof. The lower floor will be used for animal husbandry work, and the upper floor connected with the agronomy rooms of the experiment station barn and used for corn and grain judging and demonstration. The cost of this building when completed will be about $15,000.

Kentucky Station.—E. P. Taylor, assistant agriculturist and botanist, has resigned.

Minnesota College and Station.—John Thompson, assistant in agriculture at the college and station, has resigned to take up editorial work on a farm paper at Des Moines, Iowa. F. J. Wojta, assistant in agriculture at the college, has also resigned.

Montana College and Station.—V. K. Chesnut, of the Bureau of Plant Industry, this Department, has been selected to succeed F. W. Traphagen as chemist to the college and station, and will enter upon his work there in January or February; and W. J. Elliott, a graduate of the Ontario Agricultural College, who has spent some time in Minnesota in connection with the dairy industry, has been appointed assistant in the dairy work of the college and station.

Nebraska Station.—W. P. Snyder has been appointed assistant in animal husbandry in the station. The substation in the western portion of the State provided for by the last legislature has been located at North Platte, on a tract of 1,920 acres of land lying 3 miles south of the city. The function of the substation under the law is to conduct experiments on the adaptability of the arid and semiarid portions of the State to agriculture, horticulture, and forest tree growing. Tests will also be made of the effect of resting pastures and of summer and winter grazing on the carrying capacity of the range, about 1,500 acres of the tract acquired being rough grazing land. Work will be taken up at the substation early next spring.

New Hampshire College and Station.—J. C. Bridwell, recently connected with the Division of Entomology of this Department, has become instructor in botany and zoology in the college and assistant entomologist in the station. New greenhouses for the department of horticulture are in process of construction, an appropriation of $7,000 having been made by the State for this purpose.

New Jersey Stations.—George A. Billings has succeeded C. B. Lane in the position of dairy husbandman.

Cornell University.—In connection with the reorganization of the college of agriculture, John L. Stone has been made assistant professor of agronomy, S. W. Fletcher assistant professor of extension teaching in agriculture, and James E. Rice assistant professor of poultry husbandry. The latter is believed to be the first professorship of poultry husbandry established in this country.

Ohio University.—The enrollment of the college of agriculture is 207, an increase of 20 over the fall term of last year. Of these 101 are new students and 123 are in the long course, 75 being in the short course, 7 special students, and 2 post graduates.

Rhode Island Station.—B. L. Hartwell, formerly first assistant chemist of the station, has been made associate chemist.

South Dakota College and Station.—W. A. Wheeler, formerly connected with the Minnesota College of Agriculture, has been appointed botanist in the college and station to succeed D. A. Saunders, who has been granted indefinite leave of absence. Investigations in making macaroni and curing it under different conditions have been recently undertaken by the chemical department of the station.

Texas College and Station.—F. S. Johnston has been elected station agriculturist, vice B. C. Pittuck, who, as previously noted, has gone to Louisiana; and F. R. Marshall, recently of the Iowa College and Station, has been elected associate professor of animal husbandry. J. K. Robertson has been made superintendent of the Beeville Station, vice S. A. McHenry; and W. S. Hotchkiss, of Illinois, superintendent of the Troupe Station, which for some months past has been under the direction of E. C. Green, of the horticultural department. H. H. Harrington has been given a year's leave of absence for travel and study in Europe. R. L. Bennett, recently director of the Arkansas Station, has been elected superintendent of farmers' institutes. The contract has been let for a dairy barn to cost $8,000.

Washington College.—R. K. Beattie has been appointed acting professor of botany, vice C. V. Piper, who, as previously noted, has accepted a position in this Department.

Wisconsin University.—G. N. Knapp has been appointed assistant professor of agricultural engineering in the college of agriculture, in accordance with provision made for this new department by the last legislature. He is now connected with the United States Geological Survey, but will enter upon his new duties next March.

West Virginia Station.—T. C. Johnson has been appointed assistant horticulturist of the station.

Cotton Boll Weevil Convention.—A convention attended by 1,200 officials, farmers, and business men, with delegates from the Southern States and from Chicago and New York, was held at Dallas, November 5–6. The object of the convention was to consider ways and means of averting the danger to the cotton interests from the ravages of the cotton-boll weevil. The Secretary of Agriculture, B. T. Galloway, A. L.

Quaintance, S. J. Hunter, H. J. Webber, and others from this Department, delivered addresses, and stereopticon lectures were given during the evening on the boll weevil, the bollworm, and root rot. There were numerous testimonials as to the effectiveness of proper cultural methods. Resolutions were adopted urging intensive culture of cotton by approved methods and diversification, and calling on organizations of the State to encourage the adoption of tested methods by farmers. A permanent organization was formed with George N. Aldredge, of Dallas, as president, and J. H. Connell, secretary. The proceedings of the convention are to be published.

Meeting of American Public Health Association.—The thirty-first annual meeting of this association was held in this city October 26–30. A number of the papers had a more or less immediate bearing upon agriculture, and are briefly noted.

D. E. Salmon presented a report of the committee on animal diseases and food, the main part of which was occupied with a discussion of the relationship between human and bovine tuberculosis. The conclusion from the paper and from the discussion which followed was that these forms are mere varieties of one disease and are intertransmissible between man and animals. M. P. Ravenel pointed out that the transmission of tuberculosis from man to animals, and vice versa, had been shown by numerous direct experiments and clinical observations. The bovine bacillus was stated to be from 25 to 30 times as virulent as the human bacillus as a rule, although human bacilli have been found of considerable virulence for various animals. Successful experiments by the speaker in transmitting the disease from man to various species of animals were reported. Thirty-eight cases were cited in proof of the possibility of infection of man through ingestion of tuberculous milk and meat, and post-mortem statistics on intestinal tuberculosis in children as related to the drinking of tuberculous milk were discussed. The speaker briefly referred to experiments, the results of which have not yet been published, which show that infection of the lungs and lymphatic glands may be produced by ingestion of tubercle bacilli without the development of intestinal lesions. In dogs fed on butter mixed with tubercle bacilli, the bacilli were found in the chyle within 3½ hours after feeding in 8 out of 10 cases.

Problems connected with the disposal of garbage and other refuse were discussed by a number of speakers. The use of these materials for feeding pigs and for fertilizer was shown to be quite common, especially in small cities. Several of the speakers spoke favorably of the use of garbage for feeding pigs, but the general opinion seemed to be that for large cities the burning of such materials is often less expensive and preferable from a sanitary standpoint. In Memphis, where a furnace 50 ft. long has been constructed for destroying garbage, the expense thus far has averaged 15 cts. per ton, which is believed to be cheaper than feeding it to pigs. Attention was called to the utilization of heat from burning garbage and waste material in the form of steam power. From statistics obtained in England it appears that 1 ton of such refuse furnishes 40 horsepower hours of energy. The temperature in the destructors should not be 400 or 500° F., but preferably 3,000° F. It was pointed out that certain animal refuse may yield considerable revenue when treated for the extraction of oil, and that in Cleveland a digestor is in use for the removal of fats from fish refuse, which yields a revenue of from $30 to $40 a ton, the residue being burned or sold as a fertilizer.

The purification of water by filtration was discussed by M. O. Leighton. The speaker gave a historical account of filtration, and stated that the results have shown that most impurities, including typhoid bacilli, are removed by it. His conclusions regarding the value of filtration were based on analytical evidence and on the eradication of typhoid fever in different localities. Statistics from European and American cities were favorable to filtration. It was stated that many filter plants in America are defective in construction.

Considerable attention was given to a general discussion of the yellow-fever problem, with special reference to the agency of *Stegomyia fasciata* in carrying the disease, the habits and life history of this mosquito, its location in different parts of the world, and the means of destroying it.

The general subject of disinfectants was discussed and attention was called to the importance of killing insects in infected premises as a part of the process of disinfection after the prevalence of infectious diseases. Steam, formalin, hot carbonate of soda, and tobacco were recommended, and also hydrocyanic-acid gas. The latter has proved very effective in the destruction of bedbugs, cockroaches, mosquitoes, fleas, rats, and mice. Quite striking differences were reported in the resisting power of different insects and animals to this gas. For most insects it was recommended that 20 gm. of potassium cyanid be used per cubic meter of space. Certain enamel paints have been found to possess a considerable germicidal power which persists for a long period.

Havana, Cuba, was chosen as the next place of meeting, and the following officers were elected: President, C. J. Finlay; first vice-president, J. R. Monjaras; second vice-president, W. C. Woodward; treasurer, F. W. Wright; and secretary, C. O. Probst.

New Experiment Station in the Philippine Islands.—Press reports state that Governor Taft has issued a proclamation setting aside Government land adjacent to the towns of Trinidad and Baguio, in the province of Benguet, for an experiment station. This action is in accordance with the recommendations of Prof. F. L. Scribner in his report last year. Attention has repeatedly been called to the exceptionally fine climate and other natural advantages of this province, which make it well suited to the growing of a great variety of agricultural plants. An especially fine coffee is produced there, the bushes coming into bearing in 3 years. Professor Scribner says: "In the gardens of the governor of the province one sees healthy coffee trees loaded with berries, vigorous growing tea plants, hothouse gardenia, caladiums, dracænas, frangi pani, and mango trees, all plants of the Tropics; also phila tree ferns, scarlet hibiscus, passion fruit, begonias, hydrangeas, and many others of the subtropical regions, while near by are potatoes and other garden vegetables, monthly roses and pines, strictly plants of the temperate zone. Probably in no other part of the world could there be grown side by side the gorgeous vegetation of the Tropics and the pines of temperate regions, orchards of coffee, celery, and Irish potatoes."

Lord Rosebery's Experiment Station at Dalmeny Park.—It appears from information furnished by Mr. D. W. May that the Earl of Rosebery has for several years maintained a private experiment station at his estate of Dalmeny Park, 6 miles from Edinburgh. The experiments are carried on in the interest of the estate, which comprises about 6,000 acres. The work is mainly of a quite practical character and is carried on by the men in charge of the various departments, no trained specialists being employed. Experiments are made with fertilizers for different crops, especially in the use of lime and in studying the residual effects of fertilizers. The combating of plant diseases also receives attention. Plant selection is practiced, especially with the potato to develop varieties, as the whole crop of potatoes is sold for seed. Considerable work is done in feeding cattle for the market and in crossing Aberdeen Angus and Galloway with the Shorthorn, pure-bred stock being used in all cases. While not of a scientific character, the results of the station's work have proved very helpful as a guide to good practice. No publications are issued.

Improvement of Agriculture in Bombay.—An influentially signed memorial on the subject of the improvement of agriculture was recently sent to the government of Bombay, and is summarized by *Nature* from the *Pioneer Mail*. The memorialists propose that two botanic gardens should be established, one at Poona and one near Bombay, the former as the center of investigation for the Deccan, and the latter for the Konkan and Gujarat. Each garden should be provided with a herbarium and

with chemical and botanical laboratories, and to each should be attached a farm for agricultural and horticultural experiments. It is suggested that the number of the experiment stations should be increased and the scope of the experiments extended; that local bodies should be encouraged by grants to aid in conducting experiments on lines prescribed by the department; that publicity should be given to the work of the department, and results of practical interest should be communicated through leaflets printed in the vernacular; that further measures for the improvement of agricultural stock should be taken by the State; and that the forest department should be invited to cooperate with the agricultural department in the work of experimenting with products likely to succeed in forest areas.

New Horticultural and Agricultural Terms.—This subject is discussed by H. J. Webber in a recent article in *Science*, who points out the need of a suitable term to apply to plants which are propagated vegetatively by buds, grafts, cuttings, suckers, runners, slips, bulbs, tubers, etc. "The plants grown from such vegetative parts are not individuals in the ordinary sense, but are simply transplanted parts of the same individual, and in heredity and in all biological and physiological senses such plants are the same individual." Last year he suggested the word "strace," a combination of the words "strain" and "race," but he now recommends the term "clon," which he believes to be better suited to the purpose. The generic term variety would then include in cultivation groups known as "races," "strains," and "clons." He also believes the phrase "transmitting power," as applied to the faculty which an individual organism has of transmitting its individual peculiarities to its progeny, to be preferable to "prepotency," which has several other meanings.

Training of Rural Teachers.—The legislature of Michigan at its last session provided for the establishment of 10 county normal schools for the training of rural teachers in that State. The first of these schools is to be established at Standish, Arenac County.

Personal Mention.—Prof. E. W. Hilgard, of the California University and Station, celebrated the fiftieth anniversary of his graduation as doctor of philosophy on October 7. On that occasion he received from the University of Heidelberg a new diploma reconferring the title and giving a general summary of the scientific work done by him, with the congratulations of the faculty. Professor Hilgard was also presented with a congratulatory address from his colleagues of the University of California.

Frederick Law Olmsted has been appointed to the chair of landscape architecture in Harvard University known as the Charles Eliot professorship, in honor of President Eliot's son.

Otto Luebkert, Assistant Forester and Chief of the Division of Records of the Bureau of Forestry, who has been connected with the forestry work of this Department for the past 13 years, has resigned his position to engage in commercial lines.

We note from *Science* that W. J. Palmer, a graduate of the Ontario Agricultural College, has been appointed director of agriculture in the Orange River Colony at a salary of $6,000 per annum.

H. Maxwell Lefroy has, according to *Nature*, been appointed entomologist to the government of India, and will be stationed at Surat, in the Bombay Presidency, pending the establishment of the permanent headquarters of the imperial agricultural department now being organized under the orders of Lord Curzon.

Prof. L. H. Uillier has been made director of the meteorological observatory at Nantes.

S. I. Kuwana, who recently spent several years in study in this country, has been appointed entomologist at the Central Agricultural Experiment Station at Nishigahara, near Tokyo.

Prof. Julius Stoklasa, formerly director of the plant-physiological institute at Prague, has been called to the technical high school at Vienna.

Prof. A. D. Hall, director of the Rothamsted Experiment Station, is delivering a course of lectures to advanced students in the University of London on the subject of The Relation of the Composition of the Plant to the Soil in which it Grows.

Miscellaneous.—A State hygienic laboratory has been organized in Wisconsin in accordance with the legislative enactment of last winter. The laboratory is located at Madison, in connection with the bacteriological department of the university, and is under the directorship of Dr. H. L. Russell. G. J. Marquette has been appointed first assistant in the new laboratory.

By recent legislation certain powers relative to the fishing industry in Great Britain have been transferred to the Board of Agriculture, which will hereafter be known as the Board of Agriculture and Fisheries. An additional assistant secretary is provided for to have charge of the fishery interests, and Walter Edward Archer, formerly chief inspector of fisheries under the Board of Trade, has been appointed to that position.

Announcement is made that the first meeting of the Society for Horticultural Science will be held in St. Louis during convocation week, in connection with the meeting of the American Association for the Advancement of Science.

The American Conference on Tuberculosis will be held at Washington, April 4–6, 1905, and not at St. Louis in 1904, as previously arranged. This will avoid clashing with the International Congress on Tuberculosis to be held in Paris in 1904.

An international competition of apparatus for the pasteurization of milk is to be held at the Imperial Agricultural Museum, in St. Petersburg, in the spring of 1904, under the direction of the minister of agriculture and imperial domains. The competition is open to apparatus of foreign make. Prizes of 1,500 rubles ($772.50) and 500 rubles ($257.50) are offered.

Our Farmer Youth and the Public Schools is the title of an article by Prof. Willet M. Hays, of Minnesota, in the *American Monthly Review of Reviews* for October. The article deals with the movement to provide better educational facilities for the country boy, especially in the things which pertain to his prospective vocation. The plan of consolidated rural schools and agricultural high schools is described, and, leading out from these, the collegiate courses in agriculture. One of the benefits mentioned which may be expected to result from this system of education for the farmer is successful cooperation in many matters of mutual interest. The possibilities in this direction are illustrated by the cooperative enterprises carried on by associations of graduates from such schools and colleges in a number of States. "With the assistance of a large body of ex-students, organized to promote cooperative business, social, and other merged efforts among farmers, the agricultural college, agricultural high schools, and experiment stations would be profoundly influential in civic as well as in educational affairs."

An Introduction to Nature Study, by E. Stenhouse, is a new book on the teaching of nature study, or elementary agriculture and rural economy, intended primarily for the orientation and systematic guidance of teachers who take up this subject. It is designed for teachers who are lacking in training for this work and who have not gained from previous books on the subject a true conception of what nature study is. It serves as a guide to the methods to be followed, and gives detailed directions for carrying out simple experiments within the reach of school-teachers. The book is published in London by Macmillan & Co., and contains over 400 pages.

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EXPERIMENT STATION RECORD.

VOL. XV. DECEMBER, 1903. No. 4.

The report of the Secretary of Agriculture should prove an interesting document to all who are concerned, even in a general way, with the progress of agriculture in the fields of both investigation and education. It gives more attention to matters relating to agricultural education and the training of specialists than any previous report. The opening paragraph deals with the Department as a training ground or post-graduate institution for experts and specialists. The supply of these men fitted to the Department's special lines of work has not been equal to the demand, and has necessitated training them in its laboratories and offices. Since 1897, 496 students have been admitted to the Department for instruction as experts, 249 of whom have remained in its service and 185 gone elsewhere to teach, to experiment, or to demonstrate in private enterprises what they have learned.

This educational work has increased from year to year, and may now be said to form a feature of no little importance. The Department is concerning itself with practically every phase of agricultural instruction, from the assistance of the farmers by demonstration tests, popular bulletins and correspondence, the promotion of farmers' institutes, and the development of agricultural courses for various classes of institutions, to the post-graduate training of specialists.

The Weather Bureau officials have taken an active part in education along meteorological lines at colleges, universities, and schools, and the Secretary announces that the new meteorological laboratory at Mount Weather, Bluemont, Va., which is to be very completely equipped for scientific research in problems pertaining to weather phenomena, will provide facilities for a school of instruction in advanced meteorology.

The movement in the direction of improving and strengthening the courses of instruction at the agricultural colleges, and the accompanying increase in the number of students pursuing agricultural courses is commented upon, and reference is made to the developments in secondary and elementary schools of agriculture, and to the growth of interest in popular agricultural instruction.

Referring to the success of the experiment stations "in leading the way to the improvement of agricultural practice on a grand scale," the Secretary points out the need of larger funds for these institutions, and commends the matter of additional aid from the National Government for consideration. Frequent mention is made in the report of cooperation with the stations, as a means of carrying the field of observation and experiment and the influence of the Department to the various sections of the country. The Bureau of Plant Industry is cooperating with more than 40 stations in the improvement of forage crop conditions, the extension of the work on cereals, the testing of new seeds and plants, demonstration work in the treatment of plant diseases, and numerous other lines. Announcement is made that the Department is considering the wisdom of undertaking systematic cooperation with the stations in the development of types of domestic animals suited to varying latitudes and conditions, with a view to greater economy in production. This would serve to round out the work of the Bureau of Animal Industry, and would furnish the initiative and the means which are necessary for entering upon work of this character in a scientific manner.

There are many indications that the Secretary regards the stations as important agencies through which the Department should operate in extending its work throughout the country, and appreciates the mutual aid which these closely related agencies can render each other.

Referring to the aid which the Department is preparing to extend to the farmers' institute organizations of the various States, the Secretary states that "it is difficult to realize the extent and importance of the farmers' institute movement and its vital relation to the successful incorporation of the results of scientific investigations in our agricultural practice," and points out that "it is of the greatest importance that our adult farmers shall receive definite information regarding improved methods of agriculture and the principles which lie at the foundation of progress in agricultural practice."

The main part of the report is occupied with a brief survey of the scientific work of the Department and its administrative functions. This indicates not only the broad field the Department is covering in its investigations of problems related to agriculture, but the extent to which its work is at present specialized. The latter constitutes an element of strength and is one of the important developments in the recent reorganization.

Some of the larger enterprises which are prominently mentioned are the eradication of the foot-and-mouth disease in New England, which was accomplished in a little over five months at a total expense of less than $300,000, the aid which is being rendered in the introduction of forestry methods on public lands and in the management of

private tracts and wood lots, the continuation of the soil survey over nearly 15,000,000 acres during the year, irrigation investigations, and the work on the cotton boll-weevil in Texas.

The Secretary points to the results with macaroni wheats as an indication of what may be accomplished in plant introduction. It is estimated that 10,000,000 bushels of this wheat were harvested the past season, and at least 20 mills are now handling it. Tests of the bread-making qualities of macaroni wheat flour at several of the experiment stations and on a large scale by the Department have shown that a very good quality of bread can be made from such flour.

The application for advice and working plans for forest lands increases steadily, indicating the widespread interest which has at length been aroused in improved methods of management. This work, however, should not obscure the investigations which the Bureau of Forestry is conducting along other lines, among which may be mentioned tests of the strength of timber, the preservation of wood by cheap means, the control of forest insects, and a new method of gathering crude turpentine, which within a single year has revolutionized the naval stores industry, nearly doubling the yield of turpentine with practically the same labor, and greatly prolonging the life of the tree.

The studies of the duty of water form an indispensable basis for a more economical use of water in irrigation, the excessive use of which not only reduces the yield of crops and ruins large areas of fertile lands, but deprives other lands equally fertile of a water supply. An area of approximately 10,000,000 acres is now under irrigation, and canals already built cover an added area of at least 5,000,000 acres. The studies already made lead to the belief that the application of better methods would make possible the cultivation of the added 5,000,000 acres now under ditch, with very little expense for canal construction. In Oregon it is estimated that there are 3,000,000 acres of land whose products can be greatly increased by the adoption of proper methods for conserving the moisture which falls outside of the irrigation period, and equally good results are probable in other States. The Secretary refers to the importance of undertaking work in agricultural engineering, especially on the application of power to farm machinery, and recommends that the irrigation work be enlarged to include both irrigation and agricultural engineering.

Much attention is given in the report to the ravages of the cotton boll-weevil in Texas, which menaces cotton production in that and adjoining States; and a plan is outlined for combating the invasion of this insect. An appropriation of half a million dollars for this purpose is recommended, to become immediately available, in order that the campaign may be made comprehensive and effective.

The publications of the Department during the past year, which in a way may be taken as an indication of its activity, far exceeded those of

any other year. In all, 938 publications were issued, as against 757 in any previous year, and 375 of these were new publications. The total number of copies of all the publications issued aggregated nearly 12,000,000, 7,000,000 of which were Farmers' Bulletins and were distributed quite largely through members of Congress. It is a striking evidence of the general appreciation of the publications of the Department that over 30,000 copies were sold by the Superintendent of Documents, in the face of the enormous free distribution, the supply of copies for sale being inadequate to the demand.

Plans for the new buildings authorized by the last Congress have been adopted and are being worked up in detail. These plans provide ultimately for the erection of a series of ten buildings, connected by pavilions in such a way as to make practically one harmonious structure. The central feature of this series is an administrative building, and grouped about it are the laboratory buildings to be used by the various bureaus in their research work. The amount authorized by Congress ($1,500,000) will suffice for the erection of three of the laboratory buildings, which will provide a floor space of about 100,000 square feet, and will enable compliance with the terms of the appropriation act in housing those branches of the Department that are now paying rent. The erection of the administrative structure will require further appropriation.

Some interesting facts bearing upon the working force of the Department of Agriculture and the development which has taken place in this respect are presented in the annual report of the appointment clerk for the past year.

The Department was established July 1, 1862. Its immediate predecessor was the Agricultural Division of the Patent Office, the force of which included 9 persons the year that the transfer was made. In 1863, the second year of the Department, the number of employees had reached 29, and four years later it was about a hundred. This number was not exceeded until 1881, and in 1889, soon after the Department was raised to the first rank, the total number of employees was less than five hundred.

With the transfer of the Weather Bureau to the Department in 1891, the number was increased to 1,577 persons. Since that time the force has increased several hundred in number every year. During the administration of the present Secretary, from 1897 to 1903, the growth has been especially rapid, showing a net increase of 1,756 persons. In the past two years over 400 persons a year have been added to the force.

The present enrollment (July 1, 1903) is 4,200 persons. Of these, 1,410 are in the Weather Bureau, 1,386 in the Bureau of Animal Industry, 324 in the Bureau of Plant Industry, 297 in the Bureau of

Forestry, 137 in the Bureau of Statistics, 130 in the Bureau of Soils, 106 in the Office of Experiment Stations, 154 in the Division of Publications, and 58 in the Bureau of Chemistry, the remainder being distributed through the various divisions of the Department. The above number includes the inspectors, microscopists, and taggers engaged in the meat and other inspection work of the Bureau of Animal Industry, the forecast officials and observers in the regular service of the Weather Bureau, and a considerable number of special agents, student assistants, collaborators, etc., in various branches of the service; but does not include the voluntary observers and correspondents of the Weather Bureau and the Bureau of Statistics. The latter have an important part in the collection of data by these bureaus, as is indicated by the aggregate number, which reaches 67,337. The Weather Bureau has 3,341 voluntary observers and 13,996 voluntary crop correspondents. The voluntary service of the Bureau of Statistics includes 11,000 county correspondents and their assistants, 9,000 State statistical aids, and 30,000 township correspondents, from whom monthly reports are received, and these reports are supplemented from time to time by reports from farmers and planters, cotton ginners, millers, and others, bringing the total number of voluntary correspondents in its service up to approximately 256,000 persons.

In the classification of the regular force of the Department nearly two thousand fall under the head of "scientists, scientific investigators, and their assistants." While this classification does not show the number who are stricly occupied with investigation, it indicates in a general way the present magnitude of the scientific force of the Department engaged in investigation and in inspection, and undoubtedly places the Department in a class by itself among institutions of its kind in this or any other country.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

The seventeenth annual convention of this association, held in Washington, November 17–19, 1903, was one of the largest meetings in point of attendance which has ever been held. Something over 200 delegates and visitors were registered, and the representation was very general from different sections of the country. The meetings were held in the Shoreham Hotel, where very satisfactory provision was made for the general sessions and the section meetings. A very pleasant social feature was a reception tendered the convention by Secretary and Miss Wilson on the evening of November 18 at their residence. This was largely attended by the members of the association and visitors, the scientific staff of the Department of Agriculture, and others. By special arrangement the delegates paid their respects to President Roosevelt at the White House on the afternoon of November 18.

As has been customary for several years past, the annual meeting of the Official Horticultural Inspectors was held during the days of the convention, in conjunction with the meetings of the section on entomology. A brief account of their meetings is given elsewhere in this number.

The convention as a whole was notable for its harmony and the expedition with which business was transacted, and was remarked by many of the delegates as a most satisfactory meeting.

GENERAL SESSIONS.

The address of the president of the association, James K. Patterson, of Kentucky, was given on the evening of the first day of the convention. It dealt with the general topic of the origin and work of the colleges and universities represented by the association, and the influence of these institutions upon the development of technical and industrial education. It was an eloquent and scholarly review of the conditions in English and American history which have led up to the newer education, the influences which have had to be met and overcome in its development, and the recognition which technical education is now receiving, due in no small degree to the influence of the land-

grant colleges of this country. A high tribute was paid to the great work of these institutions, which the speaker declared have given a new conception of manual training and set the pace for scientific study and experimentation in America. The application of their work he pronounced far in excess of the original conception, and their experience and the methods which they have worked out have served as an example to other countries. The speaker pictured the future of this country—agricultural, industrial, and social—and along with it the future development and position of the land-grant colleges, which he conceived to be destined to occupy an increasingly prominent and important part in promoting industrial development and in contributing to the advancement of both general and applied science.

Pursuant to a resolution adopted by the association last year, provision was made for memorial addresses on the late President W. L. Broun, of Alabama, and the late President W. M. Beardshear, of Iowa. An address on the public life and services of Doctor Broun was delivered by President P. H. Mell, of South Carolina. Doctor Gunsaulus, of Chicago, who was to have delivered the address on President Beardshear, was prevented from being present, but he was requested to furnish the manuscript of his address for publication.

One of the most important items of business was the consideration of the amendments to the constitution proposed at the Atlanta meeting. These amendments had been before the association for a year, and were adopted with practically no discussion. They provide for a reduction in the number of sections to two, one on college work and administration and the other on experiment station work, three members of the executive committee to be chosen by the first section and two by the latter. No action on public and administrative questions is to be final without the assent of the college section. There is provision for each section to create such divisions as it may find desirable, but no such divisions have yet been made, and the report of the committee on the organization of the new section for station work recommended that for the present no such divisions be made. The section on horticulture and botany, however, expressed a desire to continue its meetings in the future, and appointed a committee to confer with the executive committee with reference to this matter.

The reduction in the number of sections to two will necessarily bring about a material change in the programme of these section meetings. The committee on the organization of the new section for station kwor recommended that the section be open to the consideration of all phases of station activity, including matters of administration, and the discussion of methods and appliances of research, but should not include the presentation of results of work as such, or of general papers. The papers and discussions at a given convention are to be concentrated upon one general subject, as a rule, and it is expected that there will be a rotation of subjects from year to year, so

as to cover the various lines of station activity. A standing committee on programme was provided for by each of the new sections to which subjects for discussion may be suggested.

The executive committee in its report, read by H. C. White, noted the efforts of the committee to secure the consideration of the mining school bill, and the steps which have been taken toward making a campaign for an increase in the Federal appropriation for experiment stations. The success in securing an appropriation for a college and station exhibit at the St. Louis Exposition was referred to. The committee has ascertained that the agricultural colleges will not be discriminated against in distributing the benefits of the Cecil Rhodes bequest. The committee was directed by resolution to continue its effort to secure the passage of the mining school bill and an increase in the appropriation for the experiment stations. On recommendation of the committee it was voted that hereafter vacancies in standing committees caused by resignation or death may be filled by the respective committees.

The report of the treasurer, E. B. Voorhees, showed the total receipts during the year to be $1,688.55 and the total expenditures $1,425.29, leaving a balance in the treasury of $263.23. It was voted to continue the annual assessment at $15.

The report of the bibliographer, A. C. True, called attention to the more important bibliographies which have appeared during the year, a list of 110 bibliographies with explanatory notes constituting the main part of the report. Special mention was made of the International Catalogue of Scientific Literature, several parts of which have been noted in this journal. The incompleteness of this catalogue in regard to certain lines of work in agricultural science, notably the work of the experiment stations, was a matter of much regret.

The standing committee on indexing agricultural literature called attention in its report to the index cards for the publications of the Department of Agriculture which are being prepared by the Library, and also to the cards for the accessions to the Department Library. The latter are now being printed by the Library of Congress, and can be obtained at small cost, as may also the catalogue cards of the Library of Congress relating to agriculture. The card catalogue of the Department Library now contains over 110,000 cards, and the Library is thus in position to render more efficient aid than ever before to the agricultural colleges and experiment stations by furnishing them information in regard to the literature on particular topics, loaning books, etc. Attention was called in this report to the combined index, now in press, of the first twelve volumes of Experiment Station Record, and to the card index of agricultural literature issued by this Office. It was requested that this report be published at an early date for the assistance of librarians of the colleges and stations.

The report of the committee on methods of teaching agriculture, presented by A. C. True, was on the relation of the natural sciences to agriculture in a four-years' course, and presented a plan for a course of study including these natural sciences and noting in brief the principal subjects under each to be covered. The report pointed out that the older method of arranging the courses in agriculture tended to make specialists in such subjects as agricultural chemistry or vegetable pathology, rather than to make trained agriculturists. It was urged that there should be a sufficient period of general study before specialties are taken up, and that the paths of the specialist and the agriculturist should early diverge. The college course can not be expected to fit men for expert work in this Department, the experiment stations, and similar institutions, but for such work at least a master's degree and ere long the doctor's degree will likely be required. This paper brought out much discussion, illustrating the marked interest which has developed within the past few years in the matter of courses of study and in agricultural education of different grades. The work of this committee was highly commended and was pronounced one of the most important features of the association's work.

There was considerable discussion of the subject of the graduate school of agriculture, and the hope was expressed that it may be possible to arrange for a session of this school next summer. This matter was placed in the hands of the committee on graduate study at Washington, whose title was changed by dropping "at Washington," so as to make it the committee on graduate study. President Northrop withdrew from this committee, owing to his inability to satisfactorily look after its interests, and President C. W. Dabney was appointed chairman in his place, the vacancy on the committee being filled by the appointment of L. H. Bailey.

The report of the standing committee on military instruction in land-grant colleges was made by G. W. Atherton. The committee reported interviewing the officials of the War Department in charge of military instruction in the land-grant colleges, and receiving from them an unfavorable report relative to any change being made in General Orders 94, which increases the amount of military instruction in the colleges and reduces the detail of officers to two years. This order was characterized by the chairman and by other speakers as impossible of execution, and called forth a vigorous discussion which resulted in the adoption of a resolution requesting the committee on military instruction to continue its efforts to secure a modification of General Orders 94, and to formulate a practicable scheme for military instruction at the colleges.

The standing committee on agricultural engineering presented its first report through W. E. Stone, chairman. The report pointed out

the increase in the number of engineering problems in agriculture and their prominence, the enormous extent to which agricultural machinery, and especially that of a complicated character, is being used by American farmers, the problems of irrigation and of drainage, the terracing of hillsides, the construction of roads, and other matters, as illustrating the desirability of more systematic attention to instruction in these topics in connection with the college courses and of extended scientific investigation. The courses in engineering in the colleges, it was stated, have not kept pace with the progress of the times. The committee declared in favor of separate departments of rural engineering in the colleges, and the enlargement of the work of this Department to include agricultural engineering in addition to irrigation, and recommended that the executive committee of the association aid in securing the increased appropriation asked from Congress for the latter purpose. This report was adopted, and the association also adopted a resolution commending the work of the Department along the lines of irrigation and agricultural engineering. The report brought out considerable discussion and indicated that this matter is occupying the attention of a number of institutions at this time. A special request was made that the report of the committee be speedily published in circular form in order that it may be available.

The report of the committee on collective college and station exhibit at the St. Louis Exposition was presented by W. H. Jordan, chairman, who outlined the origin and history of this movement, and gave an abstract of the law making appropriation for installing and maintaining an exhibit of animals and materials belonging to or used by the land-grant colleges and experiment stations. Details concerning the exhibit, such as the position, classification, allotment of space, and allotment of funds, were entered into, and a list was given of the persons in charge of the different exhibits. Doctor Jordan urged the hearty cooperation of the colleges and stations in the preparation of this exhibit.

The report of the committee on cooperation between the stations and this Department, presented by E. A. Bryan, called attention to the statement of fundamental principles embodied in the two previous reports, expressed gratification at the appointment of a committee within the Department of Agriculture for perfecting the details of a system of cooperation, and reiterated its belief that a full and free consultation between the stations and the members of the Department forces in regard to the work undertaken in the several States is very desirable, and would do much to remove possible sources of friction.

In this connection mention may be made of a conference held just prior to the convention, on cooperation between the Department and the stations in experiments relating to irrigation and agricultural engineering. The conference was attended by representatives of the

stations interested and of this Office. After discussion of the mutual advantage of cooperation in these larger enterprises, and of the facilities of the Office for bringing together the results of work along similar lines for publication, a plan of cooperation was suggested. It was proposed that lists of subjects should be submitted upon which cooperation is deemed desirable, those subjects which are thus shown to be of the most general interest to be taken up first. In conducting the cooperation the stations would furnish the facilities and men, and the Office of Experiment Stations would furnish a part of the necessary funds and the general supervision and publish the results, full credit being given to each station for the work done by it. A resolution favoring this plan of cooperation and pledging the hearty support of the stations interested was adopted by the conference.

The standing committee on uniform fertilizer laws, of which H. J. Wheeler is chairman, called attention to the satisfactory progress which is being made in the direction of greater uniformity, the recommendations of the association having been of value in securing the recent passage or amendment of fertilizer laws in Alabama, Florida, Indiana, Missouri, North Dakota, Pennsylvania, and Tennessee. This report also included recommendations concerning the provisions of laws for feeding stuff inspection.

The report of the standing committee on pure-food legislation, made by W. A. Withers, noted considerable progress along the line of pure-food legislation during the year. New legislation was enacted in two States, and provisions made by Congress for the inspection and control by this Department of foods imported from foreign countries. This was pronounced an unusually important step in food legislation, and its execution has resulted in considerable progress in the preparation of standards of purity.

The report of the standing committee on animal and plant breeding was presented by the chairman, W. M. Hays. The progress made during the year was reported as most satisfactory. The announcement was made of a meeting to be held at St. Louis, December 29 and 30, for the purpose of forming an association of plant and animal breeders.

The committee on revision of methods of seed testing recommended certain changes in the previous report, published as Circular 34 of this Office. These changes relate to an improved germinating chamber and other apparatus, instructions for sampling, etc.

The farmers' institute work which the Department has taken up through this Office was outlined by A. C. True, who stated clearly the policy of the Department in regard to this work. There will be no attempt to interfere with the State management of farmers' institutes in any way, but rather to cooperate with the State officials and to aid them in building up the institutes in the several States. The Department will be a general agency for coordinating and strengthening this

work throughout the country. One of the main objects at present is to help to increase the efficiency of the institute lecturers, now numbering over 800, less than half of whom are connected with the work of the colleges or the stations. A corps of specially trained institute workers was recommended as eventually desirable, to relieve the college and station men of much of the burden of this work, as it is still the opinion of the Office that the prime object of college men is to teach and of station men to investigate. The speaker pointed out the greatness and importance of the farmers' institute enterprise as a means for the future development of agriculture, the building up of a proper system of agricultural education and research, and developing a generation of farmers who will be in position to appreciate and apply the results of the work of these institutions.

A resolution presented by C. E. Thorne commended the reviews furnished by the Experiment Station Record, and suggested an extension of these to include more full abstracts in the case of some of the foreign publications, which are accessible to only a portion of the station workers, and directed the executive committee of the association to urge upon the Secretary of Agriculture the securing of additional funds for this purpose.

The plans of the new building for the Department of Agriculture were exhibited and explained by B. T. Galloway.

A very cordial invitation was extended to the association to hold its next meeting at Portland, Oregon.

The following officers were elected for the ensuing year:

President, W. O. Thompson, of Ohio; vice-presidents, D. F. Houston of Texas, J. C. Hardy of Mississippi, J. H. Worst of North Dakota, H. J. Wheeler of Rhode Island, and B. C. Buffum of Wyoming; secretary and treasurer, E. B. Voorhees, of New Jersey; bibliographer, A. C. True, of Washington, D. C.; executive committee, H. C. White of Georgia, G. W. Atherton of Pennsylvania, J. L. Snyder of Michigan, W. H. Jordan of New York, and C. F. Curtiss of Iowa.

Section on college work and administration.—Chairman, W. E. Stone, of Indiana; secretary, G. E. Fellows, of Maine; committee on programme, W. E. Stone of Indiana, G. E. Fellows of Maine, and H. W. Tyler of Massachusetts.

Section on experiment station work.—Chairman, E. H. Jenkins, of Connecticut; secretary, M. A. Scovell, of Kentucky; committee on programme, J. H. Shepperd of North Dakota, B. W. Kilgore of North Carolina, and M. A. Scovell of Kentucky.

GENERAL SESSIONS.

No sessions were held by the section on mechanic arts. The programmes of the other sections were quite full and are briefly noted below.

SECTION ON AGRICULTURE AND CHEMISTRY.

The three sessions of this section were occupied chiefly with papers and discussions relating to soils, especially soil fertility. Throughout these discussions there were frequent references to the principles laid down in a recent bulletin of the Bureau of Soils,[a] and their conflict with views which have previously been held regarding soil fertility and its maintenance.

The chairman of the section, C. G. Hopkins, of Illinois, in his opening address on The Present Status of Soil Investigations, pointed out the conflicting conclusions reached by various investigators, particularly with reference to the value of chemical methods of studying the fertility of soils. He illustrated the valuable service that chemical analysis may render in this connection by citing the results of his own studies on various typical Illinois soils, and suggested that discordant views might be harmonized and the work promoted by keeping clearly in mind the fact that functions of soils are of two kinds: (1) to furnish favorable physical conditions for plant growth, and (2) to supply the necessary plant food; i. e., they are both physical and chemical, and one is as indispensable to the successful growth of crops as the other. The use and value of leguminous crops and fertilizers and manures in rotation for maintaining and increasing soil fertility were illustrated from results of field experiments.

Milton Whitney, of the Bureau of Soils, in a discussion of Methods for the Extension and Practical Application of Soil Surveys, summarized the work of his Bureau during the past year in surveying and mapping typical soils in different parts of the United States. The main portion of his address, however, was devoted to a discussion of the work of the Bureau on the chemistry of soils as related to crop production, and a preliminary statement was made regarding investigations in progress in continuation and extension of those which were made the basis of Bulletin 22 of the Bureau. These include a further study of the physical properties of soils with reference to the movement of the soil water, which has shown little or no difference in the movement of water in widely different soils; studies of the behavior of the soil water as the drought limit is approached, which differs in a marked degree from that of the water of saturated soils or water in mass; experiments on the growth of plants in soil extracts, which gave results similar to those obtained in experiments with the original soils, and studies of transpiration as related to the functional activity of plants grown in good and poor soils and in the extracts of the same.

Transpiration was less active in the poor soils and their extracts than in good soils, and was influenced by the kind of salts present, but not by the amount. The effect of certain salts in retarding root action and of others in accelerating it was suggested as a possible explanation of the apparent influence of the use of fertilizers. The effect of aeration in correcting the poor results obtained with poor soils or their extracts was noted, and was thought to confirm the position taken in Bulletin 22 that the use of fertilizers appears to have the same effect as good cultivation. "It appears now that if we have perfect aeration . . . fertile and poor soils grow plants of equal vigor and feeding capacity." The speaker prophesied the development of a method, to be used in the field, in studying the conditions of the soil as related to the growth and functional activity of the plant, and the possible determination of how far these conditions may be changed by aeration or physical treatment. "Certainly I think it is going to be possible for us to determine what fertilizers can be used to correct these difficulties under the conditions of our experiment, which is a long way ahead of anything that we have at the present time."

A paper by E. W. Hilgard, of California, on The Chemistry of Soils as Related to Crop Production was read in his absence. This paper was an analysis of Bulletin 22

[a] U. S. Dept. Agr., Bureau of Soils Bul. 22.

of the Bureau of Soils. Doctor Hilgard questioned the reliability of the water-extract method as a means of determining the fertility of soils, and strongly dissented from many of the conclusions and generalizations contained in the bulletin. The paper cited numerous illustrations of the value of chemical methods for determining the productiveness of soils, and laid especial stress on the importance of the relative proportion of soil constituents as distinguished from their total amounts.

Three papers were read on Methods of Conducting Investigations Relating to the Maintenance or Increase of Soil Fertility. In the first of these C. E. Thorne dwelt upon the relation of laboratory and field experiments, and laid stress upon the value of the latter when continued for long periods on the same plats. Compared with such work laboratory work was declared to be comparatively simple. The requirements of plat experiments were pointed out and the necessity of great care in execution was emphasized, illustrations being drawn from the experience at the Ohio Station. The speaker was unable to see how the results of the past 10 years at that station could have been forecasted in the laboratory by a chemical or physical examination of the soil or otherwise, or how any time could have been saved. In conclusion, he laid down the general proposition that deductions relating to soil fertility must be confirmed in the field; that field work should be as scientific in its methods as laboratory work; and that when this is the case, the results are as reliable as any scientific laboratory work.

The second paper on this subject, presented by E. B. Voorhees, took up the different methods practiced to maintain and increase the fertility of the soil, considered the relation of income and outgo of plant food to crop production, and compared the availability of nitrogen from different sources for leguminous and nonleguminous crops. The discussion of these topics was based on the results of experiments conducted at the New Jersey Station. The methods of investigations pursued in this connection were described in detail in the course of the paper.

H. W. Wiley, the third speaker, outlined the reasons for the depreciation of soil fertility, and discussed at some length the results obtained by the Bureau of Chemistry of this Department, in pot culture experiments with soils from different parts of the United States. The speaker presented a comparison of the amount of phosphoric acid and potash removed by oats grown in these pot experiments, and the mount of these elements which were found soluble in two-hundredth normal hydrochloric acid under definite conditions. Attention was also called to the nitrifying power of the different soils used.

In a paper on Differences between four Southern and four Northern Soils, and Improvements in Soil Management which these Differences Suggest, F. H. King, of the Bureau of Soils, gave an account of cooperative plat experiments with different amounts of manure and guano on corn and potatoes, on typical soils in North Carolina, Maryland, Pennsylvania, and Wisconsin. In connection with these experiments observations were made on temperature, evaporation, rate of nitrification, soluble salts, and other physical and chemical conditions. The southern soils studied were more compact, i. e., less granular, had more defective aeration and drainage, but carried less water, showed a slower rate of nitrification, contained less soluble salts, and gave smaller yields than the northern soils. The means suggested for improving the productive capacity of the southern soils included deeper plowing, the turning under of more organic matter, the raising of more live stock, and the growth of smaller varieties of corn.

R. H. Forbes, of Arizona, discussed the Methods for the Extension and Practical Application of Soil Surveys, pointing out the great value of soil surveys for selecting lands adapted to new crops and industries under pioneer conditions, and especially of alkali surveys and quick and easy methods of determining the location and amounts of alkali in soils.

L. G. Carpenter, of Colorado, presented a paper on Methods and Value of Securing Irrigation Supplemental to Rainfall for Humid and Semi-arid Districts, in which he

considered the subject from the standpoint of (1) insurance against failure, and (2) securing maximum yields, as applied to humid regions and those of deficient rainfall. The advantage of supplemental irrigation as a means of securing greater diversification of crops was pointed out, and the quantities of water applied as related to the kinds of crops produced and the system of farming pursued were discussed.

A paper on Experiments in Animal Breeding was read by F. B. Mumford, who pointed out the need of experiments where all the conditions can be controlled. He gave illustrations of the kind of problems that needed to be studied in animal breeding, among others questions of prepotency, an investigation of which should form the foundation of the study of principles of breeding. Mendel's law, although it has received much attention from plant breeders, has not been demonstrated as far as animals are concerned. The need of a standard of measurements was pointed out, and birth weight was suggested as perhaps coming nearer to representing the effect of breeding than any other known standard. Experiments on the birth weight of lambs were briefly mentioned, which showed that the size and breed of the male had no relation to the birth weight, but that the latter was intimately associated with the weight of the female. A heavy birth weight was found to be intimately associated with vigor, thrift, rapid growth after birth, and early maturity of the lambs. If this is found to hold true the result is thought to be a very important one. The studies are being continued.

A paper on the same subject sent by C. S. Plumb was read by title owing to the lateness of the hour.

SECTION ON HORTICULTURE AND BOTANY.

In the absence of the chairman, H. L. Bolley, the sessions were presided over by J. C. Arthur.

Several papers dealt with the teaching of botany and horticulture in the agricultural course. L. H. Pammel, in a paper on Botany in the Agricultural Course, referred to the botanical work provided for in the syllabus for agronomy of the committee on methods of teaching agriculture, and reviewed the courses of required botany in various agricultural colleges and other institutions. He recommended that special courses in botany should be provided, as preparatory to courses in theoretical botany and the practical application of botany to horticulture and other sciences.

F. A. Woods presented, for the committee on courses in botany, an outline of a course in elementary botany, together with some suggestions as to more advanced courses. This committee was continued, and was directed to formulate its courses in reference to cognate courses on economic lines. The appointment of a committee to act in conjunction with this committee and to report courses of study in horticulture was also authorized.

The Foundation of Agricultural Teaching was the subject of a paper by H. Metcalf, in which it was contended that a few subjects pursued for a long period give better results than a larger number of topics covered in the same time. The speaker believed that agricultural botany should be developed to occupy as important a position in an agricultural course as mathematics does in mechanical or civil engineering. Plant production being the object of agronomy, plant life should be the primary study and economic plants should be the ones studied before all others. It was believed that botany should be extended over the 4 years of the college course, even if the amount of time devoted to it each year was relatively small.

In a paper on Methods of Practical Instruction in Horticulture, H. L. Hutt described the instruction in horticulture at the Ontario Agricultural College, which includes fruit growing, gardening, floriculture, and landscape gardening. Instruction is by means of lectures, laboratory work, library work, observation excursions, and practical work in the orchard and garden. Each of these methods of instruction was

discussed at some length. In the more advanced work seminary methods of instruction were followed to a great extent and have proved very profitable.

F. V. Coville gave an account of the establishment of the Desert Botanical Laboratory, which has been equipped by the Carnegie Institution near Tucson, Arizona. The relation between the purely botanical subjects which are to be studied at this laboratory and agricultural and horticultural practice was pointed out, attention being called to studies on the effective use of irrigation waters and also their economical employment. The laboratory is in charge of Dr. W. A. Cannon, formerly of Columbia University.

Cooperation was the theme of a paper by F. L. Stevens. Experiments of this character, carried on with farmers or through the rural schools, were believed to be of great value for demonstration purposes and to reach a class which bulletins do not. Numerous illustrations drawn from the speaker's own experience were cited. In discussing this paper, J. C. Arthur referred to the treatment of seed at elevators. The proprietors of one large elevator treated 150 bu. of seed oats with formalin at a cost of about 40 cts., the results being so satisfactory that the seedsmen propose treating all of their seed grain in the future. H. L. Hutt testified to the value of cooperative experiments, stating that the Ontario Agricultural College has nearly 5,000 cooperative experiments in progress.

In a second paper F. L. Stevens gave an account of the Granville tobacco wilt, which was illustrated by lantern slides. This will form the basis of a bulletin of the North Carolina Station, now in press, and will be noted later. R. E. B. McKenney, of this Department, in discussing the paper believed the disease to be the same that occurs in Ohio and other districts widely removed from North Carolina. It was pronounced due to a Fusarium-like organism.

Crop Rotation as a Factor in Combating Plant Diseases was the subject of a paper by W. A. Orton, of this Department. Many plant diseases were stated to owe their spread and injury to improper soil conditions, which may be corrected by rotation, green manuring, etc. A lack of humus and potash waste was said to be incidental to cotton rust and shedding of bolls, and these diseases can be almost entirely eliminated by rotation, green manuring, growth of winter cover crops, and application of potash. Rotation appears to be one of the most efficient ways of combating the watermelon wilt, and the cotton-root rot, which has been referred to species of Ozonium, can be readily controlled by this means. The tomato Fusarium disease requires rotations with 5 or more years intervening between crops of tomatoes. Diseases which spread through the air, whether of fungus or bacterial origin, are less easily influenced by rotations, but the vigor of the plant can be increased by the restoration of soil fertility. In addition to rotation, resistant varieties are necessary for such diseases as cotton wilt, nematodes, etc. Rotations for the orchard and nursery were also discussed with reference to root rot, nematodes, etc.

M. A. Carleton exhibited forms of notebooks and records, which he has found very well adapted to field and laboratory work in his investigations with cereals. The system described was designed to secure accuracy, rapidity, uniformity, and permanency of records.

A report was made from the committee on plant-breeding nomenclature, favoring the use of the word "clon," which has lately been proposed by H. J. Webber for plants grown from cuttings, bulbs, etc., the progeny all being members of the same individual.

SECTION ON ENTOMOLOGY.

The sessions of this section were presided over by J. B. Smith in the absence of the chairman.

In a paper on Problems of Forest Entomology, A. D. Hopkins called attention to the need of special methods of eradication in fighting forest insects, since many of

the methods used on field and garden crops are not profitable. The most important point is that the methods should be inexpensive, and fortunately such methods have been found in the control of certain forest insects, especially insects injurious to tan bark. Trees infested with the pine-bark beetle should be cut between October and May. In the control of forest insects good results may be had from girdling trees to serve as trap trees.

The importance of laboratory and field work in economic entomology was emphasized by E. P. Felt, who argued in favor of accurate laboratory experiments, by means of which many details of life history and habits may be worked out more satisfactorily than under field conditions. All methods of investigation, however, should be combined, and it was urged that the data obtained from untrained observers may often prove quite reliable and valuable. The same speaker also described several record devices, notably cards for recording data relating to specimens, and arrangements for filing entomological correspondence.

C. M. Weed read a paper on Keeping Entomological Notes, describing the usages in vogue in New Hampshire, and exhibiting file boxes for holding bottles of alcoholic material, and also boxes for holding leaf galls and other coarser material.

J. B. Smith read a paper on The New Jersey Ideal in the Study and Report upon Injurious Insects. The speaker argued that farmers desire practical information, and do not care for technical details. The entomological bulletins should be educational, but should not contain material relating to synonymy or even descriptions of new species. The feeding habits of insects should be described, likewise the nature of injury caused by them and the reason for the application of the recommended treatment. Attention should also be called to the relation of the treatment to cultural methods and the life history of the insects. Laboratory results should be confirmed by field investigations. At the New Jersey Station no insectary is maintained; a few breeding cages are kept in the laboratory, but most observations are made in the field.

A. F. Burgess discussed the necessity of uniform methods of inspection of nursery stock. Attention was called to the fact that the San José scale is the direct cause of most inspection laws, and to the necessity of studying the source of infestation. Infested city lots and neglected orchards frequently furnish great difficulties in the control of the San José scale. Fumigation with hydrocyanic-acid gas was shown to be perfectly effective in destroying the scale, and not injurious to fruit trees when applied in the proper manner. Fumigation was held to be far more satisfactory than inspection, since it is impossible to detect all cases of infestation by San José scale, woolly aphis, or crown gall. The proportions of cyanid of potash, sulphuric acid, and water used in various States were presented in statistical form and the 1 : 1 : 3 formula was recommended.

SECTION ON COLLEGE WORK.

In this section two subjects were discussed: The Mission of the Land-Grant Colleges, and Short Courses. The first subject was introduced by W. O. Thompson, of Ohio, in a paper setting forth (1) the history of the movement bringing the land-grant colleges into existence, and (2) the writer's interpretation of the first and second Morrill Acts, based partly on the discussions in Congress bearing on those acts. Briefly stated, the writer's conclusions were that those favoring the establishment of the land-grant colleges were of the opinion that some other form of education than the classical may be liberal; that it was the intention of these men to give a liberal as well as a practical education, implying that industrial education is liberal; that precedence was to be given always to agriculture and mechanic arts, and that military instruction was intended to occupy a subordinate position. In his opinion the act of 1890 did not indicate a change of mind on the part of Congress regarding the

mission of the land-grant colleges, but rather an attempt to interpret more fully and in detail the act of 1862, regarding which there had been considerable misunderstanding.

A round-table discussion of short courses was participated in by nearly a dozen speakers. Nearly all were agreed that the short course should not be taken by young students who might profitably pursue agricultural high school or college courses and that no credits for degrees should be given for short-course work. H. H. Goodell stated that at the Massachusetts Agricultural College short-course students have taken agriculture, horticulture, bee culture, etc., in the regular college classes. This plan was criticised by several, President Northrop laying special emphasis on the desirability of keeping the short-course work outside of the circle of regular college work. He considered the short courses as "charitable or benevolent appendages" on the college, allowable only when they will not detract from the efficiency of the regular college work. R. W. Stimson considered short courses as pioneer work—more or less temporary expedients, for the purpose of extending the influence of the college and of drawing students to the long courses.

In the subsequent informal discussion the idea was advanced that young students should go to agricultural high schools or colleges, and older students should get their instruction in farmers' institutes and like organizations. In opposition to this plan, J. C. Hardy contended that there is a wide gap between the farmers' institute and the agricultural high school, and that technical instruction of all grades should be provided for, either in the agricultural colleges or in special schools organized for the purpose.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of available phosphoric acid and potash in calcareous soils, H. H. Cousins and H. S. Hammond (*Analyst, 28 (1903), No. 329, pp. 238–240*).—The method of Dyer was found to give unsatisfactory results when used with the highly calcareous soils of Jamaica. By following the practice advocated by Hilgard of neutralizing the carbonates in the soil before subjecting it to the solvent action of the citric acid solution, results were obtained which agreed with the known productiveness of the soil.

The solvent action of the liberated carbon dioxid and of the neutral citrate formed have been urged as objections to this modification of the method, but comparative tests made by the authors on soils free from carbonates and on those to which carbonates were added showed that the solubility of the phosphoric acid remained absolutely constant whether carbonates were added and neutralized or not. "As regards potash, the figures indicate that in two cases the carbonic acid has exerted an additional solvent action. Our experience in Jamaica leads us to doubt whether citric acid is an adequate detective solvent for all forms of potash in a soil available for present consumption by plants."

On the determination of free phosphoric acid and the amount of this substance in superphosphates, A. D. Herzfelder (*Landw. Vers. Stat., 58 (1903), No. 5–6, pp. 471–479*).—The method of the association of German fertilizer manufacturers, viz, titration of the water extract with soda solution, using methyl orange as an indicator, is described, as well as the official Austrian method and that of Müntz, in both of which free phosphoric acid is determined gravimetrically in the alcohol extract. Comparative tests of the methods are reported and objections to all of them are pointed out.

The author proposes the following method: Extract 1 gm. of the finely ground substance in a Soxhlet apparatus with water-free ether for 10 hours. Evaporate the ether and take up in about 20 cc. of water, evaporating to dryness and taking up in water 3 times. Filter and wash with water slightly colored with methyl-orange as long as a red color is observed. Usually from 100 to 150 cc. of water is required. Titrate the filtrate with normal soda (?) solution, multiplying the number of cubic centimeters used by 7.1 to get the percentage of free phosphoric acid present.

A comparative study of French, English, German, and Hungarian superphosphates with reference to water-soluble and free phosphoric acid showed the last two to be much richer in free phosphoric acid than the French and English superphosphates.

The quantitative determination of phosphates in the stomach contents, G. H. A. Clowes (*Amer. Jour. Pharm., 75 (1903), pp. 325–330*).

A modification of Dumas' volumetric method of determining nitrogen, R. Bader and A. Stohmann (*Chem. Ztg., 27 (1903), No. 52, pp. 663, 664, fig. 1; abs. in Chem. Centbl., 1903, II, No. 12, p. 740*).—The principle of Lippman and Fleissner's

modification of Kopfer's method[a] is applied in Dumas' method, the method of conducting the combustion being described in detail.

The applicability of Dumas' method of determining nitrogen to gas mixtures, C. CHARITSCHKOFF (*Zhur. Russ. Fiz. Khim. Obshch., 35 (1903), pp. 411–416; abs. in Chem. Centbl., 1903, II, No. 5, p. 311*).

Concerning methods of estimating nitrogen and protein in feces, A. ZAITSCHEK (*Arch. Physiol. [Pflüger], 98 (1903), No. 11–12, pp. 595–613*).—Experiments which are reported led the author to conclude that feces in drying undergo a marked loss of nitrogen which is greater in the case of carnivora than of herbivora. Adding acid when the feces are dried does not entirely prevent this loss, and if accurate results are desired the nitrogen should be determined in a number of samples of fresh feces. To learn the digestibility of protein the albuminoid nitrogen in food and feces should be determined. The nitrogen lost in drying feces is dependent upon the amount of nonalbuminoid nitrogen present and is doubtless also influenced by the water content of the feces.

The oxidation of atmospheric nitrogen by means of electrical discharges, F. VON LEPEL (*Ber. Deut. Chem. Gesell., 36 (1903), No. 6, pp. 1251–1258*).—A brief account of studies of conditions favoring the process.

Table for calculating protein from nitrogen using the factor 6.25, O. GÖLTSCHKE (*Ztschr. Analyt. Chem., 42 (1903), No. 8, Sup., pp. 10*).—The protein values are given corresponding to amounts of nitrogen ranging from 0.01 to 16 per cent.

The determination of nitric acid in water, A. MÜLLER (*Ztschr. Angew. Chem., 16 (1903), No. 31, pp. 746, 747*).—The method of Schulze-Tiemann is considered preferable to that of Frerichs (E. S. R., 14, p. 940).

A new quantitative method of determining ammonia, A. BAYER (*Chem. Ztg., 27 (1903), No. 66, pp. 809, 810*).—The method is applicable to such solutions as sewage, liquid manure, tanning liquors, etc., and is as follows: To 100 cc. of the solution add 2 cc. of fuming hydrochloric acid and 2 drops of phenolphthalein and for each 50 mg. of NH_3 per liter 15 cc. of 10 per cent magnesium chlorid. Add 12 to 15 gm. of pulverized disodium phosphate and shake in a rotary apparatus until the phosphate is completely dissolved, then add sodium hydrate solution drop by drop until a faint permanent rose color is obtained. The gelatinous precipitate formed becomes crystalline after standing ¼ hour and the rose color disappears. Add soda solution until the color remains permanent, allow to stand ¼ hour, and filter without washing. Distill ammonia from the filter and contents by means of magnesium oxid.

Progress in the field of the chemistry of waters, including natural and artificial mineral waters, A. GOLDBERG (*Chem. Ztg., 27 (1903), No. 71, pp. 869–874*).—A review (with numerous references) of the literature published on this subject during 1902.

A new method for the determination of organic substances in waters, more particularly in those containing chlorids and bromids, C. LENORMAND (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 15, pp. 810–814*).—A colorimetric method is proposed in which the color obtained by adding permanganate to the water without further treatment is compared with that obtained by adding sodium bicarbonate along with the permanganate and boiling.

The influence of distilled water on the determination of the reducing power of potable and sewage water by means of permanganate solution, H. NOLL (*Ztschr. Angew. Chem., 16 (1903), No. 31, pp. 747, 748*).—Distilled water was found to introduce a decided error, which should be determined and corrected.

Solubility of gypsum in solutions of sodium chlorid, A. D'ANSELME (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), pp. 372–374; abs. in Jour. Chem. Soc. [London], 84*

[a] Monatsh. Chem., 7 (1896), p. 9.

(*1903*), *No. 489, II, p. 478*).—The solubilities obtained in solutions of different concentrations agree with those reported by Cameron (E. S. R., 13, p. 927).

On the protamins and the constitution of albuminoid substances, A. KOSSEL (*Bul. Soc. Chim. Paris, 3. ser., 29* (*1903*), *No. 14, pp. I–XVIII*).

A new method of determining sulphuric acid, F. RASCHIG (*Ztschr. Angew. Chem., 16* (*1903*), *No. 26, pp. 617–619*).—A discussion of some of the difficulties encountered in using the method proposed by Müller (E. S. R., 15, p. 121).

Titration of sulphuric acid with benzidine chlorhydrate, W. J. MÜLLER (*Ztschr. Angew. Chem., 16* (*1903*), *No. 27, pp. 653–655*).—A reply to the above article.

Determination of sulphuric acid by means of benzidine, F. RASCHIG (*Ztschr. Angew. Chem., 16* (*1903*), *No. 34, pp. 818–823*).—Further comments on Müller's method.

The estimation of sulphur in urine by means of sodium peroxid, G. MODRAKOWSKI (*Ztschr. Physiol. Chem., 38* (*1903*), *No. 5–6, pp. 562–566*).

Hoppe-Seyler's handbook of physiological and pathological-chemical analysis, THIERFELDER (*Hoppe-Seyler's Handbuch der physiologisch- und pathologisch-chemischen Analyse. Berlin: Hirschwald, 1903, 7. ed., pp. 618; rev. in Hyg. Rundschau, 13* (*1903*), *No. 5, pp. 227, 228*).—A revised edition of this valuable text-book. The attempt has been made to include the material which has accumulated since the previous edition.

The examination of meat, yeast, and other extracts for xanthin bodies. I. The xanthin bodies of meat extracts, K. MICKO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6* (*1903*), *No. 17, pp. 781–791*).—Analytical methods are described.

The electrolytic estimation of minute quantities of arsenic, more especially in brewing materials, T. E. THORPE (*Jour. Chem. Soc.* [*London*], *83* (*1903*), *No. 489, pp. 974–986, figs 2*).

Determination of vanillin in vanilla, A. MOULIN (*Bul. Soc. Chim. Paris, 3. ser., 29* (*1903*), *No. 7, pp. 278–280*).—The decolorized ether extract is treated with a mixture of sulphuric and acetic acids and crystals of potassium nitrate are added. The formation of methyl picrate from the vanillin gives the solution a yellowish color, which is compared with a scale prepared with known amounts of vanillin.

The detection and estimation of mineral acid in acetic acid and vinegar, P. SCHIDROWITZ (*Analyst, 28* (*1903*), *No. 329, pp 233–237*).

A new method for the determination of halogen compounds in organic substances, H. DAUBIGNY and G. CHAVANNE (*Bul. Soc. Chim. Paris, 3. ser., 29* (*1903*), *No. 15, pp. 807–810*).

The use of normal sodium oxalate in quantitative analysis, S. P. L. SÖRENSEN (*Ztschr. Analyt. Chem., 42* (*1903*), *No. 6–7, pp. 333–359, fig. 1*).—The author concludes from the results of experiments which are reported that sodium oxalate when carefully prepared and dried at 230° C. can be used in the titration of acids without noticeable error, even in work requiring very accurate determinations.

The testing of sodium oxalate and its use in volumetric analysis, S. P. L. SÖRENSEN (*Ztschr. Analyt. Chem., 42* (*1903*), *No. 8, pp. 512–516*).—Methods for determining the presence of water, sodium carbonate, and inorganic and organic impurities in sodium oxalate are given, with brief directions for the use of this material in volumetric analysis.

The absorption of nontanning substances by hide powder and its influence on the estimation of tannin, H. R. PROCTER and F. A. BLOCKEY (*Jour. Soc. Chem. Ind., 22* (*1903*), *No. 8, pp. 482–484*).

Select methods of chemical analysis, A. CLASSEN and H. CLOEREN (*Ausgewählte Methoden der analytischen Chemie. Brunswick: Friedrich Vieweg & Son, 1903, vol. 2, pp. XVI+831, pls. 3, figs. 133*).—This is the second volume of this work, previously referred to (E. S. R., 13, p. 421). Special methods are given for oxygen, ozone, hydrogen, hydrogen peroxid, sulphur, chlorin, bromin, iodin, fluorin, nitrogen,

explosives (nitro-cellulose, nitro-glycerin, dynamite, explosive gelatin and gelatin dynamite, and smokeless powder), argon, helium, phosphorus, boron, silicon, carbon, carbon monoxid and dioxid, percarbonate and hydrocyanic acid, and for the elementary analysis of organic compounds.

Textbook of chemical technology, F. FISCHER (*Lehrbuch der chemischen Technologie. Leipzig: Otto Wigand, 1903, pp. VI+293, figs. 188*).—An abridgment of the author's larger *Handbuch der chemischen Technologie.*

Plant and agricultural chemistry for students and agriculturists, M. SOAVE (*Chimica vegetale e agraria ad uso degli studenti e degli agricoltori. Torino: Carlo Clausen, 1902, pp. XV+415, figs. 41*).

Introduction to the study of plant and agricultural chemistry, K. ASO and E. POZZIESCOT (*Introduction à l'étude de la chimie végétale et agricole. Paris: F. R. du Rudeval, 1903, pp. 200*).—A simple and original presentation of this subject based upon lectures on agricultural chemistry by O. Loew at the Imperial University of Tokyo.

An apparatus for the determination of nitrogen, R. MARQUIS (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 14, pp. 780–782, fig. 1*).—A pump and endiometer for use in the Dumas method are described.

A method of calibrating burettes, D. W. HORN and ELIZABETH M. VAN WAGENER (*Amer. Chem. Jour., 30 (1903), No. 2, pp. 96–105; abs. in Chem. Centbl., 1903, II, No. 12, p. 737*).

Picnometers, R. LEINBACH (*Jour. Prakt. Chem., n. ser., 66 (1902), No. 9–10, pp. 475–477, fig. 1; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 14, p. 928*).—Two forms are described.

A new condenser, BRACONNIER and G. CHATELAIN (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 14, pp. 779, 780, fig. 1*).—This condenser is so arranged that the cooling medium passes through as well as around the vapors to be condensed, thus presenting a larger condensing surface and adapting the apparatus to highly volatile substances.

A pressure regulator for fractional distillation under reduced pressure, G. BERTRAND (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 14, pp. 778, 779, fig. 1*).

A new absorption apparatus and safety tube, H. VIGREUX (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 15, pp. 841–843, figs. 3*).

A gas furnace for laboratories, K. FRIEDRICH (*Ztschr. Angew. Chem., 16 (1903), No. 36, pp. 857–861, figs. 2*).

On the history of the thermometer, F. BURCKHARDT (*Verhandl. Naturf. Gesell. Basel, 16 (1903), pp. 1–69, fig. 1*).

International catalogue of scientific literature. D—Chemistry, II (*Internat. Cat. Sci. Lit., 2 (1903), pt. 2, pp. XIV+671*).—This completes the volume, the first part of which was previously noted (E. S. R., 14, p. 632).

BOTANY.

The synthesis of albuminoids by plants, E. LAURENT and E. MARCHAL (*Bul. Acad. Roy. Belg., Cl. Sci., 1903, No. 1, pp. 55–114*).—A historical review is given of the sources of nitrogen for plants, the investigations of many authors being critically summarized. After reviewing the literature the authors describe at considerable length their experiments on the synthesis of albuminoids by various flowering plants. The methods of determining the different forms of nitrogen are described and comparisons are drawn between the action of flowering plants and some of the lower orders.

The authors conclude that in the case of the lower orders of plants, such as *Clostridium pasteurianum*, various bacteria, Rhizobium, etc., these organisms are able to assimilate free atmospheric nitrogen, either when living autonomously or in sym-

biosis with leguminous or other plants. Ammoniacal nitrogen is readily assimilated by the lower orders of plants without the intervention of sunlight, but in the higher plants the assimilation, while taking place in darkness, is much more active in the light. Nitric nitrogen is assimilated by the lower organisms in darkness, but among green plants with few exceptions the assimilation of nitrates is most rapid when the plants are exposed to the light and particularly in the more refrangible rays of the spectrum. Whenever free nitrogen, ammonia, or nitric nitrogen are assimilated in darkness there is a considerable consumption on the part of the plant of carbohydrates, which furnish the necessary energy for the reduction and synthesis of the albuminoids.

The lower plants in general are able to synthesize albuminoids in the dark, but in higher plants, as a rule, this takes place only in the light. Among the higher plants amid bodies in limited quantity are produced in portions of the plants which are free from chlorophyll, as in the instance of germinating seeds in darkness. There does not seem to be any transformation of nitric acid or ammonia in a full-grown flowering plant except that taking place in the sunlight.

The influence of light and darkness upon growth and development, D. T. MacDougal (*Mem. New York Bot. Gard.*, *2* (*1903*), *pp. XIII + 319, figs. 176; abs. in Bot. Centbl.*, *92* (*1903*), *No. 14, pp. 296, 297*).—After summarizing the previous investigations on the effect of light and darkness on the growth of plants, the author gives the results of his own experiments with over 100 species, representing many orders of plants. The etiolated condition of the leaves of different plants, the effect of darkness on flowers and inflorescences, and the effect on spores and sporangia of ferns are described. In discussing the theories of etiolation and the effects of light and darkness, the author says that etiolation is not an adaptation to darkness, and that the forms which plants assume in the dark are not governed by an effort to reach the light.

The various phenomena of etiolation are, in the first instance, due to the mere absence of light, and subsequent modifications appear which may be regarded as beneficial to the plant, but at times may prove disadvantageous. The comparison of normal and etiolated plants shows that growth and differentiation are not only independent phenomena, but are easily separable. Light acts as a stimulating influence in inducing morphological differentiation, but it is not necessarily direct in its action, since the stimulative influence may be received by one portion of the plant and transmitted to another. The impulse may often be communicated to organs which are not actually formed at the time of the stimulation.

The amount of growth or increase in volume that may be accomplished by the extension of the imperfectly developed tissues in the absence of illumination is subject to great variation. In many instances the total length, diameter, and volume of the etiolated shoot may be less than that of a normal one, while in other instances it may be decidedly greater. The author states that there is no evidence afforded by the behavior of plants in darkness to warrant the conclusion that light directly affects the rate of growth. A bibliography of more than 200 references accompanies the work.

The influence of a lack of oxygen on plants, M. Dude (*Flora*, *92* (*1903*), *p. 205; abs. in Bot. Centbl.*, *93* (*1903*), *No. 27, p. 18*).—The effect of a lack of oxygen on various seeds and spores was investigated. It was found that keeping seed in an atmosphere free from oxygen resulted in their ultimate death.

Quite a number of species of seed were kept in an oxygen-free chamber for a considerable time and samples were tested from day to day for their vitality. Rye lost its germinative ability after 50 days' exposure, peas after 43 days, sunflowers 40 days, vetches 35 days, and white mustard 15 days. In every case germination was retarded. Where the seed and spores were kept free from oxygen for only 5 days their germination was considerably retarded and the subsequent growth was entirely abnormal.

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When growing plants were investigated the young parts were affected sooner and more severely than the more mature portions of the plant. The effect of varying quantities of oxygen was not tested.

The effect of sulphurous acid on plants, A. Wieler (*Ber. Deut. Bot. Gesell., 20* (*1902*), *p. 556; abs. in Bot. Centbl., 92* (*1903*), *No. 10, p. 205*).—Sulphurous acid is shown to have a more or less detrimental effect upon the assimilative activity of all plant tissues. In the experiments of the author *Ficus elastica* and *Abutilon* sp. lost all power of assimilation when subjected to atmospheres containing a considerable quantity of the gas. The beech tree was found sensitive to 1 part in 314,000, and the fir to 1 part in 500,000. Grapes were less injured by small quantities of sulphurous fumes, and oaks were still more resistant.

The author shows that the stomata are left open when exposed to the gas and the carbon dioxid assimilating mesophyll is liable to injury. A somewhat prolonged exposure to the gas causes the green tissues to become yellow and the chlorophyll loses its ability to normally regenerate the destroyed chloroplasts. Another effect of the sulphurous-acid gas is to drive the water from the leaf cells into the intercellular spaces, as can be readily seen by the examination of such susceptible leaves as those of the beech.

The presence of hydrocyanic acid in the buds of Prunus, E. Verschaffelt (*Arch. Neerland. Sci. Exact. et Nat., 2. ser., 7* (*1902*), *pp. 497–509; abs. in Bot. Centbl., 92* (*1903*), *No. 9, pp. 183, 184*).—A report is given of studies made on the variation of hydrocyanic acid during the opening of buds of species of Prunus. The proportion of hydrocyanic acid in the buds and young shoots shows that the absolute quantity increases very materially during the opening of the buds, while the relative quantity in the different parts may remain the same.

The cause of the variation is not positively determined, but it was found that the hydrocyanic acid in the internodes was not less below closed buds than open ones. In the case of *Prunus laurocerasus* the evergreen leaves placed in darkness retained their hydrocyanic-acid content much longer than the recently developed leaves. These begin to turn yellow and rapidly lose their prussic acid. There does not appear to be any less hydrocyanic acid in the leaves after the budding of branches which carry them. It seems probable that the buds and the young shoots contain glucosids of the amygdalin type.

The presence of solanin in tobacco seed, J. Starke (*Rec. Inst. Bot. Univ. Bruxelles, 5* (*1902*), *pp. 295–298; abs. in Bot. Centbl., 92* (*1903*), *No. 9, pp. 182, 183*).—The author investigated the claim of Albo that tobacco seeds contain an alkaloid similar to, if not identical with, solanin. The method employed was checked by testing potato shoots for solanin, after which 12 gm. of tobacco seed and later 124 gm. of the seed of *Nicotiana macrophylla* were tested in the same manner without finding a trace of solanin or any analagous substance.

The rôle of diffusion and osmotic pressure in plants, B. E. Livingston (*Decen. Pubs. Univ. Chicago, 2. ser., 8* (*1903*), *pp. 162; abs. in Bot. Centbl., 93* (*1903*), *No. 27, p. 19*).—In the first part of this work the author summarizes the physical side of diffusion and osmotic pressure, while in the second portion he considers the physiological problems involved. A summary is given on the effect of turgidity on plants, and chapters are given on the absorption and transmission of water and materials held in solution. In regard to the latter the author concludes that by far the most important factor in their distribution through the plant body is simple diffusion.

Concerning the influence of osmotic pressure, the author concludes that while weak solutions may accelerate vital activities, concentrated ones retard them. The effect of high concentration seems to be due to the extraction of water from the living cells of plants. Whether this is the direct cause of response to these concentrated solutions is not known.

The electro-motive force in plants, A. B. Plowman (*Amer. Jour. Sci., 4. ser., 15* (*1903*), *pp. 94–104; abs. in Bot. Centbl., 93* (*1903*), *No. 29, p. 61*).—In a preliminary

paper giving the results of experiments on white lupine, *Codiæum regalis*, and *Poinsettia* sp. the author concludes that the functional activities of the plant cause differences of electrical potential in its various parts, and the intensity of these differences depend, in part at least, on the physiological condition of the plant.

Recent investigations in plant hybridization, C. CORRENS (*Bot. Ztg., 2. Abt., 61 (1903), No. 8, pp. 114–126; abs. in Bot. Centbl., 92 (1903), No. 21, pp. 418–488*).—The author gives a critical review of the more important contributions to the subject of plant breeding which were published during the autumn of 1901 and the spring of 1902.

Observations on the temperature of the subterranean organs of plants, H. H. DIXON (*Trans. Roy. Irish Acad., 32 (1903), pt. 3, Sec. B, pp. 145–170, pls. 3*).—According to the author, while the temperature of the above-ground part of the plant has been a subject of considerable investigation, but little attention has been given to the underground portions. He reports experiments in which the temperature of hyacinth bulbs, tubers of anemone and peony, roots of *Ficus carica* and *Vitis vinifera*, etc., were examined.

He found that subterranean organs, like the aerial parts of plants, may have during active growth a higher temperature than their surroundings. After the period of active growth has passed this elevation of temperature is no longer noticeable. There does not appear to be any true diurnal periodic rise in the temperature of subterranean organs such as has been reported by many investigators for aerial organs, and whatever rise does take place is due to the increased respiratory activity of the plant. In the less massive subterranean organs, such as fibrous roots, the variation in temperature is not sufficient to make itself appreciable above the fluctuations of the surrounding medium.

The author discusses the errors affecting the thermoelectric method of determining plant temperatures and gives some suggestions for reducing them to a minimum.

A comparison of the vegetation of the Landes and that of Fontainebleau, G. BONNIER (*Bul. Soc. Bot. France, 50 (1903), No. 2, pp. 174–176*).—A comparison is made between the character of plants of the same species grown in the Landes district of France and in the vicinity of Fontainebleau. The soil of the Landes is very sandy, underlaid at no great depth with a moist subsoil, while at Fontainebleau the sandy soil is of great depth. The plants of the 2 regions show marked differences in their general aspect, in their structure, and in their physiological functions. One striking difference was the entire absence of nectar and consequent insect visitation of plants at Fontainebleau that produced abundant nectar in the Landes.

Ferns, C. E. WATERS (*New York: Henry Holt & Co., 1903, pp. XII+362, figs. 228*).—A manual for the northeastern States, with analytical keys based on the stalks and on the fructification. The book is popular but thoroughly scientific, and describes and illustrates all the ferns known to occur in the range of Gray's Manual of Botany. Keys are furnished for the identification of all the species, and aided by the excellent illustrations it is possible for even an amateur to recognize any species met with. Many of the illustrations are from photographs made especially for this work and are not excelled by any similar publication. A chapter is devoted to the subject of fern photography, which with slight modification would doubtless be adapted to use in photographing other groups of plants. This work will be found to be one of the leading popular books on the ferns of the region included.

METEOROLOGY—CLIMATOLOGY.

Methods of meteorological investigation, W. N. SHAW (*Science, n. ser., 18 (1903), No. 459, pp. 487–497*).—This is an address before the subsection of astronomy and meteorology of the British Association for the Advancement of Science at its Southport meeting. It is a plea for closer cooperation between the universities and state weather services in order to build up a more thorough and effective sytem of

meteorological investigation. The unsatisfactory condition of present knowledge relating to the movement of the atmosphere and its relation to weather conditions is pointed out, and attention is called to the importance of simultaneous barometer readings in different parts of the world with corresponding weather observations in order that a synchronous weather chart for the world may be constructed. The importance of correlating the results of studies of the upper atmosphere with conditions prevailing at the surface is also pointed out. In general the author concludes that "the real requirement of the time is not fewer observations, but more men and women to interpret them."

Tables of daily precipitation at special river and rainfall stations of the United States Weather Bureau for the years 1893, 1894, 1895 (*U. S. Dept. Agr., Weather Bureau Doc. 228, pp. 256*).—The arrangement of the tables is alphabetical and the record is complete to the letter P. Notice of this compilation has been delayed in expectation of its completion.

Meteorological observations, J. E. OSTRANDER and F. F. HENSHAW (*Massachusetts Sta. Met. Buls. 175, 176, 177, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July, August, and September, 1903. The data are briefly discussed in general notes on the weather of each month.

Annual precipitation in Oklahoma, C. M. STRONG (*Oklahoma Sta. Rpt. 1903, p. 65*).—A tabular summary of the precipitation records for 25 places in the Territory, including data for 1902 and previous years (extending in some cases to 1889) and general averages.

Meteorological observations, C. B. RIDGAWAY (*Wyoming Sta. Rpt. 1903, pp. 49, 50*).—A summary of observations at Laramie, Wyo., on temperature, relative humidity, dew-point, atmospheric pressure, precipitation, evaporation, and direction and velocity of the wind during the year 1902.

British rainfall, 1902, H. S. WALLIS and H. R. MILL (*London, 1903, pp. LXXVI + 250, illus.*).—Observations at 3,500 stations are summarized.

"Red rain" and the dust storm of February 22, T. E. THORPE (*Nature* [*London*], *68* (*1903*), *No. 1758, pp. 222, 223*).—Analyses of the dust are reported and discussed. (For previous note see E. S. R., 14, p. 1054.)

Meteorological annual for 1903, A. LANCASTER (*Annuaire météorologique pour 1903. Brussels: Observatoire météorologique de Belgique, 1903, pp. 660*).—This annual contains, among other papers, articles on A Study of the Force of the Wind in Belgium, by A. Lancaster; The History of Meteorology in Belgium, by J. Vincent; A Study of the Movement of Cirrus Clouds in Cyclones and Anticyclones, by E. Van der Linden, and Bibliographic Notes on Clouds (Classification and Nomenclature), by J. Vincent.

Meteorology of the spring of 1903 (*Bul. Dir. Agr. et Com.* [*Tunis*], *8* (*1903*), *No. 28, pp. 400–405*).—Observations at a number of places in Tunis on rainfall, temperature, humidity, cloudiness, wind movement, etc., are summarized for the months of March to May, 1903.

A study of the climate of Tunis, G. GINESTOUS (*Bul. Dir. Agr. et Com.* [*Tunis*], *8* (*1903*), *No. 28, pp. 347–394, pls. 3, figs. 18*).—The climatic features of different sections of Tunis are discussed and the available meteorological observations are summarized in tables and diagrams.

Indian rainfall, J. ELIOT (*Indian Met. Memoirs, 14* (*1902*), *pp. 709*).—This is a reprint of Blandford's tables of rainfall published in 1886, with the inclusion of similar data for the 14 years, 1887–1900.

Variations in barometric pressure and the forecasting of weather, J. PÉROCHE (*Rev. Sci. Paris, 4. ser., 20* (*1903*), *No. 4, pp. 108–110*).

WATER—SOILS.

The artesian waters of South Dakota, J. H. SHEPARD (*South Dakota Sta. Bul. 81, pp. 43–62*).—This is substantially a condensed reprint of matter first published in Bulletins 41 and 49 (E. S. R., 7, p. 287; 8, p. 965) of the station.

Significance of silicic acid in waters of mountain streams, W. P. HEADDEN (*Amer. Jour. Sci., 4. ser., 16 (1903), No. 92, pp. 169–184*).—Chemical studies of the waters of the Cache la Poudre River and some neighboring streams are reported which show a very high percentage of silicic acid (15 to 46 per cent of the solid matter) in the waters. This is believed to be "due to the action of water and carbon dioxid, and, perhaps, also of the acid products arising from the decomposition of vegetable matter on the feldspars of the granite of the region."

On the application of fluorescein in underground hydrology, E. A. MARTEL (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 3, pp. 225–227*).—A summary of results of observations by the author and others on the efficiency of fluorescein as a means of studying the movement of underground waters.

Soil moisture investigations for the seasons of 1901 and 1902, J. J. VERNON and J. D. TINSLEY (*New Mexico Sta. Bul. 46, pp. 46*).—The investigations here reported are a continuation of those previously reported (E. S. R., 13, p. 430). The later experiments, however, were transferred to land which was thought to be more uniform than that used in the experiments of 1899 and 1900. The soil of the plats used is in the main made up of river deposit with more or less wash from the foothills. "The first and second feet are mainly clay loam, passing into loam in some places and into clay in others. . . . The third foot varies from loam to clay loam, and in some places there are thin strata of clay. The fourth foot is generally a reddish sand, and under this lies a fairly clean sand down to the water table at about 14 ft." The soil "is variable enough to prevent the results on the different plats from being strictly comparable."

The ground was plowed to a depth of about 6 in. in November, 1900. Borders were thrown up around the plats and the first irrigation was given December 18, 1900, the second February 7, 1901. In March following 2 plats were subsoiled to a depth of about 20 in. The seed bed was prepared by disking the soil 3 or 4 in. deep and leveling with a smoothing board. Corn was planted April 10 and on May 8 all the plats were irrigated. For the crop of 1902 the ground was prepared in about the same way as in the previous year. It was plowed in December, 1901, and 2 plats were subsoiled. All except 3 plats were given a heavy irrigation on March 12. On April 3 the soil was stirred to a depth of 2 or 3 in. with harrows and corn was planted. All plats were again irrigated on April 23. Certain plats were not irrigated after the spring application of water in order to determine the amount of moisture in the soil when corn shows decided effects of drought; some plats were irrigated when the corn seemed to need it; some were irrigated only twice—when the corn was a few inches high and at time of tasseling; some were irrigated in the ordinary Mexican way—at time of planting, before tasseling, and when the grain was forming; and finally, certain plats were irrigated every 10 to 14 days. Observations on the growth of the crop and the moisture content of the soil at frequent intervals were made as in previous experiments. The conclusions reached are as follows:

"While the 'Mexican method' of 3 irrigations will produce a fair crop of corn, it is probable that in ordinary seasons from 1 to 3 additional irrigations may be given with advantage.

"In general, the moisture content of the soil and yield of corn increase with the number of irrigations; but on the individual plats there is little if any connection between moisture content and yield.

"The custom in this valley of partially substituting irrigation for cultivation is not without some foundation. The moisture content of the soil and the yield of corn are not materially increased by frequent surface cultivations on these soils.

"Subsoiling in these tests has not proved to be of marked advantage.

"On this soil, clay loam, corn wilts when the amount of moisture falls much below 20 per cent.

"The benefit derived from winter irrigation will depend mainly on the texture of both surface and subsoil. In these tests its benefit was confined mainly to insuring good germination."

In an attempt to determine the effect of frequent cultivation on the soil moisture, it was found to be "practically impossible with ordinary implements to produce a dust mulch on the clay loam and clay soils" experimented with, which are characteristic of the Mesilla Valley.

Electrodes of the moisture apparatus placed at different depths (3 to 18 in.) in the soil within 3 ft. of irrigated plats "showed no appreciable rise in the moisture content of the soil during the season." The conclusion is therefore drawn that "in the clay loam soils of the Mesilla Valley lateral percolation is very slight."

On the mechanical analysis of soils, T. Schloesing (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 26, pp. 1608–1613; 137 (1903), Nos. 6, pp. 369–374, fig. 1; 7, pp. 399–402*).—The author shows as a result of a continuation of previous investigations (E. S. R., 14, p. 18) that it is possible to separate the fine sand of cultivated soil (*terre végétale*) into a number of grades of decreasing degrees of fineness by noting the time required for deposition from water of a given depth and the weight of the deposits formed during successive intervals of time.

A method of mechanical analysis of soils based upon this principle, with the apparatus required, is described. The sample of soil previously treated on the filter with weak nitric acid to remove lime, and afterwards with weak ammonia and freed from coarse particles by decantation, is shaken up in water in a cylinder 33 cm. long. This cylinder is provided with devices for automatically maintaining a constant level of water, and for draining off the deposits formed through the bottom into receptacles drawn under the outlet of the cylinder by clockwork arrangement. The operation requires about 21 hours and is practically automatic. It is not claimed that exact results are obtained by the method, although as the average of the results with various soils 7 grades of sand were separated, varying in diameter of particles within the following limits: (1) 70–90 mm., (2) 65–80 mm., (3) 50–70 mm., (4) 30–50 mm., (5) 20–35 mm., (6) 15–20 mm., (7) 5–15 mm. Particles smaller than 5 mm. in diameter remain in suspension indefinitely.

A contribution to the study of the assimilation of the minerals of the soil by plants, J. Crochetelle (*Ann. Sci. Agron., 2. ser., 1902–3, II, No. 1, pp. 33–44*).—This article reports studies of the basicity of different soils (calcareous and noncalcareous) by means of citric acid, as used in Dyer's method for available plant food in soils, and of the assimilation of phosphoric acid by chlorotic plants. The determination of the lime content of soils by means of dilute citric acid was found to be very unreliable in the case of granitic soils, but very useful in case of soils producing chlorotic plants. Data are reported which indicate that plant chlorosis is due to interference with phosphoric acid assimilation by an excess of lime in the soil neutralizing the root secretions of the plants.

Practical methods for maintaining the fertility of the soil, W. Saunders (*Connecticut State Bd. Agr. Rpt. 1902, pp. 203–228*).—An argument in favor of better care and utilization of farm manures.

Soils—their requirements and improvements, H. J. Wheeler (*New Jersey State Bd. Agr. Rpt. 1902, pp. 127–158, pls. 5*).—A general discussion of this subject based mainly upon the investigations of the experiment stations, especially that of Rhode Island.

Unproductive black soils, H. A. HUSTON (*Indiana Sta. Bul. 95, pp. 31, pls. 4, figs. 5*).—This is practically a reprint of Bulletin 57 of this station (E. S. R., 8, p. 34), with the addition of mechanical and chemical analyses of 3 samples of unproductive black sandy soil and 1 sample of unproductive muck. The chemical analyses indicate a deficiency of phosphoric acid and potash, especially the latter, in the black sandy soils. The unproductive muck soil, however, contained larger percentages of these than adjacent productive soil. The conclusions regarding the temporary improvement of unproductive black lands by use of straw or kainit and permanent improvement by means of efficient drainage are the same as in the previous bulletin. In the present bulletin, however, more specific recommendations are made regarding the use of kainit and other potash salts as fertilizers for corn on black lands containing considerable sand but not having a high-water level. A trial of phosphoric acid in addition to potash salts is also suggested.

Soil conditions in the Philippines, C. W. DORSEY (*Philippine Bureau Agr. Bul. 3, pp. 57, pls. 10, fig. 1, map 1*).—This bulletin discusses general soil conditions in the abacá or Manila hemp districts; in Union Province, Luzon, and in the Philippine forests, and gives an account of a more detailed survey of the Batangas area, Luzon. The agricultural adaptations of the various soils are given special attention. It is stated "that certain districts possess soils adapted to the cultivation of Manila hemp, sugar cane, rice, tobacco, cocoanuts, coffee, and cacao, . . . but there are also many fine tracts of land where these industries can be greatly extended and improved, and new crops, such as cotton and tea, a host of fine fruits, and minor produce crops can be profitably introduced."

The preservation of the soil from damage caused by sluits, E. B. BRADFIELD (*Agr. Jour. Cape Good Hope, 23 (1903), No. 2, pp. 190–195*).—This article discusses briefly the damage caused by and methods of prevention of soil washing.

Reclamation of drift sands in Cape Colony, C. D. H. BRAINE (*Agr. Jour. Cape Good Hope, 23 (1903), No. 2, pp. 161–178, pls. 4*).—A description of the extent and character of the drift sands of Cape Colony, with some account of the government attempts to reclaim these areas, and analyses of Eerste River drift sand at different depths and periods. The method of reclamation followed has involved the spreading of town refuse on the sand and the planting of sand-binding trees and grasses. The average cost of 5 years' reclamation work at Eerste River was $48.74 per acre. The trees found most useful for planting on the sands were *Acacia saligna* and *A. cyclopis*. Various species of Eucalyptus have also been planted with more or less promise of success.

"The Fabricia (*Leptospernum lævigatum*) propagates readily, and is most effective in arresting sands in warm climates. Other useful trees are the *Tamarix gallica*, *Widdringtonia cupressoides*, and the *Cupressus macrocarpa*. . . . Of the grasses used in the Cape Colony, by far the most successful is the *Ehrharta gigantea* or pypgrass, the vigor of its growth far exceeding that of any other. Perhaps the most useful is the indigenous *Triticum junceum*, which is being used on the exposed littoral dune at Port Elizabeth, as it thrives well near the sea. The *Elymus arenarius* does not grow freely on the driest parts of the sands, and has, on the whole, shown poor germination, although in some cases healthy and strong. Extensive experiments have been made with marram grass (*Psamma arenaria*), also known as *Ammophila arundinacea* and *Arundo arenaria*, but the results have been very disappointing. . . . Other useful grasses are the *Cynodon dactylon* and *Sporobolus matrella*, which were self-introduced at Eerste River and grew vigorously. The Panicum and Stenotaphrum are also indigenous grasses that do well on sandy soils."

Agricultural geology, J. E. MARR (*London: Methuen & Co., 1903, pp. XI + 318, figs. 104, map 1*).—The author states in his preface that "this book has been written, after study of the schedule framed for the guidance of candidates for the International Diploma of Agriculture, to be used by students who are reading for examinations in

agriculture, though it may be found useful to others." It is divided into 4 sections: (1) Study of the composition and structure of rocks; (2) the operations of geological agents, including weathering, agents of transport, etc.; (3) geological surveying; and (4) study of the strata of the British Isles in the order in which they were formed.

FERTILIZERS.

Fertilizer experiments, C. A. MOOERS (*Tennessee Sta. Bul. Vol. XVI, No. 1, pp. 20, figs. 5*).—This bulletin gives the results of experiments on fortieth or fiftieth-acre plats, to determine the fertilizer requirements of certain typical Tennessee soils and to test the best methods of applying fertilizers. The crops experimented with were sweet potatoes, white potatoes, grass and clover, and cowpeas. "Both field experiments and laboratory work on the soils of this State are of more than ordinary value, on account of the uniform composition of each type. Those of most importance in East Tennessee repeat themselves in narrow strips, having a general direction from northeast to southwest. The typical soils of the other sections of the State are not so complicated and will require less investigation."

Both chemical analysis and field experiments show the need of phosphoric acid on all of the soils experimented with. Next to the fundamentally important phosphoric acid, nitrogen is most needed, and the least needed element is potash. In the experiments with sweet potatoes, the principal object was to determine the most profitable amount of fertilizer and the best proportions of the fertilizing ingredients, especially the best amount of cotton-seed meal to use in connection with the standard amount (300 lbs. per acre) of acid phosphate. The soil used for the experiments was a sandy loam characteristic of the iron limestone formation. Greatly increased yields were obtained from the use of a mixture of 350 lbs. of cotton-seed meal with 300 lbs. of acid phosphate. The addition of potash produced little effect. The most profitable returns, however, were obtained during 2 seasons by applying 1,520 lbs. per acre of a mixture consisting of 720 lbs. of cotton-seed meal, 600 lbs. of acid phosphate, and 200 lbs. of muriate of potash. "Judging from other results, however, the amount of potash could have been reduced to advantage."

The experiments with white potatoes were made on a shale soil very deficient in plant food and on a very poor white gravelly hill soil. On the basis of the results obtained, the following fertilizer mixture is recommended: 360 lbs. of cotton-seed meal, 300 lbs. of acid phosphate, and 50 lbs. of muriate of potash, used at rates of from 500 to 1,000 lbs. per acre.

The experiments with orchard grass and clover were made on what had formerly been very poor and unproductive soil, but which had been improved for the grass by turning under a crop of cowpeas and rye which had been moderately fertilized and manured.

"The yields of grass and clover were greatly increased by applications of acid phosphate and nitrate of soda. Acid phosphate used alone affected the clover more than the grass, while the mixture of acid phosphate and nitrate of soda resulted in a predominating growth of grass. Acid phosphate, 300 lbs. to the acre, used alone, greatly increased the yield of clover, and was by far the most profitable fertilizer."

The experiments with cowpeas were made on a soil known to be very deficient in phosphoric acid, the special object being to compare the relative fertilizing value of raw phosphates with acid phosphate. Acid phosphate alone gave the most profitable returns. On very poor land good results followed the use of potash in addition to the phosphate. In both pot and field experiments fine-ground raw rock phosphate did not produce any marked increase of yield on a soil known to be poor in phosphoric acid. "In pot experiments the phosphoric acid from fine-ground raw bone was found to be about one-half as efficient for both cowpeas and turnips as the phosphoric acid from acid phosphate."

In the experiments on methods of applying fertilizers it was found that "better results followed the use of 250 lbs. of a complete fertilizer for corn when applied in the row than when applied broadcast and harrowed into the soil. Slightly better yields came from the broadcast application of 500 to 1,000 lbs. to the acre than from the same amounts applied in the row, but the results should not be considered conclusive. Cotton-seed meal was found to retard seriously the germination of seed with which it was applied in direct contact, and it should not therefore be drilled with wheat. When applied in the row for crops planted in rows it should be mixed with the soil before the seed is dropped. Cotton-seed meal applied broadcast in the fall for wheat gave favorable returns as compared with nitrate of soda furnishing the same amount of nitrogen."

Notes on the management of barnyard manure, H. BUHLERT (*Fühling's Landw. Ztg., 52 (1903), Nos. 17, pp. 625–630; 18, pp. 647–654*).—A review of investigations on this subject.

Derivation of animal ammoniates—dried blood, tankage, hoof meal, bone, and other products, E. M. PAGET (*Amer. Fert., 19 (1903), No. 3, pp. 5–23, figs. 12*).—The method of manufacture of these products used in packing houses is described. Articles previously noted (E. S. R., 14, p. 953) are incorporated in this article.

A new source of nitrogen for agriculture, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 6 (1903), No. 32, pp. 173–176*).—This is a summary and discussion of the experiments of Wagner and Gerlach (E. S. R., 15, p. 25) on the fertilizing value of the so-called lime nitrogen (calcium cyanamid).

Rendering atmospheric nitrogen available for agriculture and industry, A. FRANK (*Ztschr. Angew. Chem., 16 (1903), No. 23, pp. 536–539*).—This is the full text of a paper read before the International Congress of Applied Chemistry at Berlin, in 1903, a brief extract of which has already been noted (E. S. R., 15, p. 131).[a] In it the author gives statistics of consumption of nitrogen compounds to show the importance and desirability of some practical means of utilizing atmospheric nitrogen for industrial purposes. He reviews the history of attempts to fix the free nitrogen of the air in the form of nitrates, cyanids, and ammonia from Priestley's experiments in 1785 in oxidizing the atmospheric nitrogen by means of the electric spark to the recently proposed methods of preparing cyanamid by passing atmospheric nitrogen freed from a large part of the oxygen normally associated with it in the air over fused carbids of the alkali earths or by fusing a mixture of calcium carbonate and coal in presence of the nitrogen gas in an electric furnace.

In this connection he refers to the work of himself and Caro beginning in 1895 on the preparation of the carbids of the alkali earths, originally with a view solely to the manufacture of cyanids, experiments being made first with barium carbid and later with calcium carbid. It was found in these experiments that the fixation of the nitrogen by barium or calcium carbid did not result in the formation of barium or calcium cyanid, as was expected, but in barium or calcium cyanamid ($BaCN_2$ or $CaCN_2$) which yielded cyanids on fusion with alkali salts. By heating the cyanamid with water under high pressure calcium carbonate and ammonia were formed as follows: $CaCN_2 + 3H_2O = CaCO_3 + 2NH_3$. The better grade of cyanamid prepared by the above process contain from 14 to 22 per cent of nitrogen. By dissolving the cyanamid in water and crystallizing in the cold, a dicyanamid $(CN_2H_2)_2$ containing 66 per cent of nitrogen was obtained. This is a white salt resembling ammonium chlorid.

The fertilizing value of the cyanamid (the so-called lime nitrogen) is discussed, and the experiments of Gerlach and Wagner (E. S. R., 15, p. 25) are referred to as establishing the high value of the product for this purpose.

[a] In the previous notes on this subject the cyanamid has been incorrectly referred to as a by-product of acetylene-gas manufacture.

Preliminary report of the Cyanid Company of Berlin on its work in the preparation of cyanids and on the utilization of the nitrogen of the air for fertilizing purposes (*Ztschr. Angew. Chem., 16 (1903), No. 22, pp. 520–522*).—The article explains the principles and the development of the company's processes of preparing cyanamids and cyanids, first from barium carbid as proposed by Frank and Caro, and later from calcium carbid as proposed by Pfleger; and also by direct treatment of a mixture of calcium carbonate, coal, and atmospheric nitrogen in an electric furnace.

The fertilizing value of the cyanamid is briefly noted, and other commercial applications of the process, e. g., in preparing cyanids, etc., are explained.

The preparation of alkali cyanids from calcium cyanamid, G. Erlwein (*Ztschr. Angew. Chem., 16 (1903), No. 23, pp. 533–536; Chem. Ztg., 27 (1903), No. 47, p. 567*).—This is a paper read before the International Congress of Applied Chemistry at Berlin, 1903, which reviews the history of the development of this process with special reference to its commercial applications.

The utilization of atmospheric nitrogen, F. Rothe (*Ztschr. Angew. Chem., 16 (1903), No. 27, pp. 658, 659*).—The author claims in this article to have worked out independently of Frank and Caro the processes involved in the fixing of free nitrogen of the air by means of carbids of the alkaline earths or mixtures of carbonates of the alkaline earths and carbon.

Progress in the potash industry, M. Hagen (*Chem. Ztg., 27 (1903), No. 60, pp. 747–749*).—A brief review.

Frosts and potash fertilizers, L. Dumas (*Jour. Agr. Prat., n. ser., 6 (1903), No. 33, p. 226*).—A brief note on a recent article by Couturier (E. S. R., 15, p. 236), in which it is suggested that the effect of potassic fertilizers in increasing the resistance of plants to frost is probably due to the greater vigor of plants so treated, and that doubtless resistance to frost is accompanied by an equal power of resistance to fungus diseases.

Fertilizers, R. E. Rose and E. E. McLin (*Mo. Bul. Florida Dept. Agr., 13 (1903), No. 85, pp. 17–39*).—The results of inspection under State law of a large number of samples of fertilizers are reported, with notes on valuation, average composition of fertilizing materials, etc.

Fertilizer inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 94, pp. 93–103*).—This bulletin gives the results of analyses of samples of commercial fertilizers collected by a representative of the station. It also includes notes on valuation.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1903, No. 21, pp. 54*).—The results of analyses of 489 samples of fertilizers examined from March to June, 1903, are reported.

Analyses of commercial fertilizers and manurial substances, C. A. Goessmann (*Massachusetts Sta. Bul. 90, pp. 30*).—Analyses are reported of 225 samples of fertilizers collected in the course of regular fertilizer inspection during 1902, and of 77 samples of fertilizing materials sent to the station for examination, including wood ashes, lime ashes, coal and wood ashes, tankage, ground bone, cotton-seed meal, nitrate of soda, lime compounds, phosphatic slag, bat guano, horse manure, sheep manure and wool waste, sugar beet refuse, cassava waste, compound fertilizers, and soils.

Fertilizer analyses, F. W. Robison (*Michigan Sta. Bul. 210, pp. 125–145*).—The results of the inspection of fertilizers during the spring of 1903 are reported with the test of the Michigan fertilizer law, and a brief general discussion on the nature and use of fertilizers.

Analyses of commercial fertilizers (*South Carolina Sta. Bul. 82, pp. 10*).—This bulletin reports analyses and valuations of 163 samples of fertilizers examined during the season of 1902–3.

Commercial fertilizers and commercial poisonous insecticides, H. H. Harrington (*Texas Sta. Bul. 67, pp. 21–34*).—"This bulletin contains a discussion

of some of the fundamental principles underlying the use of fertilizers and insecticides, together with their chemical composition, and a list of dealers and agents who handle commercial fertilizers in this State." Analyses of 67 samples of fertilizers and 9 samples of insecticides examined in accordance with State law, and 7 samples of miscellaneous fertilizing materials, including tobacco waste, goat and sheep manure, barnyard manure, and spent boneblack from a sugar refinery, are reported.

Fertilizers, 1903, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 86, pp. 41*).—Analyses are reported of 128 samples of fertilizing materials sent to the department of internal revenue by manufacturers, importers, or vendors, in accordance with the provisions of the fertilizer act of 1890, as representing the goods to be offered for sale in Canada during the season of 1903–4. The tabulated analyses are accompanied by notes on the extent of the fertilizer trade in Canada, on the "citric soluble" phosphoric acid of fertilizers (that is, the phosphoric acid soluble in 1 per cent citric acid), and on the use of fertilizers and manures in general, the latter including determinations of moisture, ash, and nitrogen in 24 samples of peat moss.

Commercial fertilizers in Portugal, O. Klein (*Ztschr. Angew. Chem., 16 (1903), No. 34, pp. 829–831*).—Statistics of the trade are given. It is stated that from 75,000 to 80,000 tons of fertilizers are annually used in Portugal.

Is the assimilation of free nitrogen due to bacteria or is this a chemical process? II, A. A. Bonnema (*Chem. Ztg., 27 (1903), No. 67, pp. 825, 826*).—In continuation of previous investigations (E. S. R., 14, p. 850) the author reports observations on the iron content of the root tubercles of leguminous plants, which he believes show that iron hydroxid is present in considerable amounts and is essential to the process of assimilation of free nitrogen by the root tubercle organisms.

FIELD CROPS.

Report of the Upper Peninsula Substation for the years 1901 and 1902, L. M. Geismar and C. D. Smith (*Michigan Sta. Spec. Bul. 20, pp. 1–26*).—After describing the station grounds and discussing the weather conditions which prevailed during 1901 and 1902, the authors report the results of culture tests with a large number of cereal, forage, and horticultural crops.

Of 4 varieties of winter wheat Dawson led, with a yield of 41 bu. per acre, followed by International No. 6, with 33.23 bu. In the tests with Spring wheat for the 2 years, Wild Goose yielded from 6 to 10½ bu., Velvet Chaff over 19, Saskatchewan Fife 12, and Minnesota No. 163 and Stanley each 17⅓ bu. per acre. Nicaragua gave a very small yield and Canadian Blue Democrat proved to be a weak variety.

Plat tests were made with 10 varieties of barley in 1901 and 6 varieties in 1902. The first season all varieties lodged badly. Swan, which seemed to have the stiffest and longest straw, ripened earliest. The second year Manchuria led, with a yield of 41.66 bu. per acre, followed by Oderbrucker, Canada Six-Rowed, French Chevalier, and Canadian Thorp, with yields of 30.83, 25.5, 25.5, and 24.5 bu. per acre, respectively.

The season of 1901 was not very favorable for oats. Black Beauty and Daubeny gave the best results in strength of straw and weight and yield of grain. These 2 varieties yielded over 42 bu. per acre, while Silver Mine ranking next in yield produced only 33.33 bu. In 1901, 5 varieties, Columbus, Black Beauty, Lincoln, American, Banner, and Dupauper, produced 63.75, 53.75, 52.50, 48.75, and 37.50 bu. per acre, respectively.

Among the large number of varieties of corn grown in 1901, Gilman and Wernich Sweet Pearl Dent proved superior. Neither in 1901 nor in 1902 did any variety mature perfectly. Minnesota King came nearest to reaching maturity, followed by

Yellow Dent. Seed ripened at the station proved equal in vitality to seed obtained from other sources. Only 1 variety of sweet corn, Oakview Early Market, planted May 23, reached the edible stage.

Notes on the growth of a large number of forage crops are given. Good results were obtained with a number of varieties of alfalfa, including sand lucern. Crimson Clover in 1902 yielded 2,533 lbs. of hay per acre. The yields of field peas for the season ranged from 29 to 41 bu. per acre. The Black-Eyed Marrowfat pea gave a yield of 41 bu. of peas and 4,100 lbs. of straw per acre. Winter vetch produced 4,373 lbs. of hay per acre, while spring vetch gave a little less than 3,000 lbs. A yield of 920 lbs. of ripe seed per acre, with 5,400 lbs. of straw, was obtained from spring vetch in 1902.

Spring vetch and wheat grown together produced 5,200 lbs., and vetch alone only 3,400 lbs. of hay per acre. The mixed crop cured in a much shorter time than the vetch alone. Frost injured the growth of soy beans, and completely destroyed cowpeas. Lentils yielded at the rate of 160 lbs. of seed and 3,760 lbs. of straw per acre. In 1902 brome grass gave a yield of 3,285 lbs. of hay per acre in July, and by the middle of September had again headed at a height of 16 in. The growth and yields of rye, clover, timothy, orchard grass, redtop, spurry, sorghum, millet, rape, hemp, and flax are briefly noted.

The results of variety tests with potatoes in 1901 are reported and a number of varieties described. Pingree and Sir Walter Raleigh ripened earliest, being followed by Bovee, Six Weeks, Pride of Michigan, Hearst, and Irish Cobbler. Sir Walter Raleigh, Rose of Erin, Northlight, and Wonder of the World, in the order given, were most resistant to blight. Delaware led with a total yield of 333.33 bu. per acre, followed by Sir Walter Raleigh with 312.84, and Rose of Erin with 293.33 bu. In 1902 Sir Walter Raleigh ranked first, with a yield of 226.33 bu., and Rose of Erin second, with a yield of 222.22, while Delaware this season gave only 151.11 bu.

The results of fall and spring planting of potatoes, together with the effects of spraying with Bordeaux mixture against blight, are reported. The fall planting was done October 30, and the different varieties under test matured from September 15 to 28. The yields obtained from fall planting compared very favorably with spring planting. Spraying in every case largely increased the yield. The work with vegetables and fruits is noted elsewhere.

Cooperative work with the U. S. Department of Agriculture, E. NELSON (*Wyoming Sta. Rpt. 1903, pp. 57–66*).—This work consists of grass and forage plant investigations. A number of grass plats were started in 1901, and the record of the second year's growth is here reported. *Festuca pratensis*, *F. rubra*, *Agropyron occidentale*, *A. dasystachyum subvillosum*, and *Bromus pumpellianus* remained green during September, while the other species reached full maturity in August. *Bromus pumpellianus* surpassed both *B. inermis* and *B. marginatus* in thriftiness and amount of leaf growth. *Melilotus officinalis* made a dense growth, but was entirely killed by frost on September 11. *Poterium sanguisorba* grew from 13 to 20 in. high and matured seed. It withstood the frost well and remained green until late in the fall.

Experiments in methods of seeding were made with *Atriplex argentea*, *A. nuttallii*, and *A. truncata*. Seeding ½ in. deep gave the best results. No difference was observed between late fall and spring seeding. Seeds of the 3 species were stratified in moist sand in a cool cellar for 60 days and planted in comparison with dry seed. A few plants were obtained from the stratified seed of *A. argentea* and *A. truncata*, while none of the dry seeds grew. Germination tests of seed of 7 species showed very low percentages of germination for the species with seeds inclosed in very thick and hardened bracts. Of the seed of *A. philonitra* and *A. truncata*, with bracts not so thick and indurated, 27 and 39 per cent, respectively, germinated, and of 25 husked seeds of *A. nuttalii*, 24 grew. Seeds of *A. argentea* run through a hand-grinding mill for the purpose of crushing the husk produced plants much earlier than untreated seeds, and the growth at the end of the season was also considerably larger.

Report on cultural tests in 1901–2, A. DAMSEAUX (*Bul. Agr. [Brussels], 19 (1903), No. 1, pp. 1–12*).—Among a number of varieties of wheat Desprez Yellow square head, Kirsche Improved square head, Teverson, and White Flemish proved most resistant to an extremely wet season. In a fertilizer test with rye the plat receiving 2 kg. of superphosphate gave a larger yield than the plats receiving 4 or 6 kg. Ligowo and Yellow Flemish oats were the most productive varieties.

The attacks of rust on oats were less severe where the crop had been fertilized with Thomas slag. The best quality of sugar beets was produced by Schlitte Hornung Kleinwanzlebener, and Strube. Kirsche Improved Yellow mangel among 6 common varieties produced the largest yield and the largest quantity of dry matter per hectare. The roots of this variety ranked first in the percentage of nitrogenous substance. The quantity of leaves and crowns produced were smallest among the varieties tested.

A plat of chicory fertilized with sulphate of ammonia gave a much better yield of dry matter than a plat fertilized with nitrate of soda. Topping tobacco apparently increased the yield by 400 kg. per hectare and the nicotine content by 1.2 per cent. Abutilon this season failed to ripen seed and produced only 680 kg. of fiber per hectare as compared with 1,400 kg. the year before.

A new variety of lupine having a red blossom produced 39,400 kg. of green forage per hectare and seemed well adapted to moderately stiff calcareous soils. Soil inoculation tests with lupines and vetch proved effective in pot cultures, but gave contradictory results in the field.

The content of dry matter, sugar, and nitrogen compounds in fodder beets at different stages of growth, J. A. LE CLERC (*Inaug. Diss., Univ. Halle, 1903, pp. 56*).—The work with field beets by different investigators is briefly reviewed, the analytical methods employed by the author are described, and the results of analyses made at regular intervals from June 6 to November 11 are tabulated and discussed. It was found that the percentage of water in the beet bore a close relation to the rainfall, rising with the increase in precipitation and falling with the decrease. The highest percentage of sugar in the dry matter was reached September 9, during the period of greatest light intensity. This period also showed the highest temperature and the longest duration of sunshine.

Beets grown at intervals of 30 cm. in rows 45 cm. apart were found to contain on September 22 and October 20 1.43 and 2.27 per cent more water and 13.95 and 11.56 per cent less sugar in the dry matter, respectively, than beets grown in the same way, but with the exception that 2 plants were allowed to grow in a hill instead of one. The beets thinned to 1 plant in a place yielded 7,714 kg. of dry matter and 3,345 kg. of sugar, while the thicker-grown beets produced 10,240 kg. of dry matter and 5,579 kg. of sugar per hectare.

Analyses made November 11 showed that the upper third contained more water and less sugar than the rest of the beet, while the lower third was richer in sugar and poorer in water than the upper portion. The middle third was about an average between the two. This result is considered an argument for the culture of beets developing mostly beneath the surface of the soil.

During the period of rapid growth the leaves contained about 93 per cent of water, but analyses made October 30 showed that their water content had fallen to 90 per cent. Sugar was not detected in the leaves by means of the polariscope.

The crown of the beet is estimated to comprise from 15 to 25 per cent of the entire plant and about 75 per cent of the portion growing above ground. The water content of the crowns remained about constant between the dates of October 18 and October 30. This portion contained about 17 per cent of the total sugar content of the beet. In completely-developed beets the author regards the crowns as containing one-sixth of the dry matter and the sugar, 18 per cent of the total nitrogen, and 24 per cent of the nitric acid.

At the beginning of the investigation the proportion of nitrogen and dry matter was 1:28 and at the end 1:70. On July 28 the proportion of nitrogen to sugar was 1:19 and on October 30 1:40. The dry matter and the sugar increased much more rapidly than the nitrogen. The thinned beets had a higher nitrogen content than the unthinned and smaller beets. It is believed that owing to a greater assimilating surface the larger plants absorbed more nitrogen salts, especially nitrates. In the thinned and unthinned beets 35 and 48 per cent, respectively, of the nitrogen was in the form of nitrates. The nitrogen content was largest in the crown and diminished toward the point, being in this respect the reverse of the sugar content.

The author discusses the albuminoid, nitric, and amid nitrogen content of fodder beets. All of the nitrogenous compounds except the amido acids increased relatively much faster in the roots during ripening than in the tops. The roots contained approximately 0.7 of the dry matter, 0.8 of the sugar, more than half of the total nitrogen and albuminoids, and 0.7 of the amids. The feeding value of the roots and tops is considered.

Improvements in cereals, W. SAUNDERS (*Connecticut State Bd. Agr. Rpt. 1902, pp. 119–129, pl. 1*).—This article contains a brief review of the work in this line by a number of plant breeders, and has special reference to the improvement of wheat, barley, and oats by the Canadian Experimental Farms. General directions for carrying on the work are given.

A partial record of the crossing with wheat at these farms shows that from 1,650 flowers carefully worked, only 220 kernels were obtained. Crosses of Hard Red Calcutta and Gehun, early Indian varieties, and Ladoga, an early maturing Russian sort, with Red Fife and White Fife, were made to combine the earliness of the Indian varieties with the vigor, productiveness, and high quality of the Fife wheats. The cross-bred varieties thus obtained ripen 3 to 4 days earlier than the Fife varieties and are vigorous and productive. Of the different new sorts, Preston, a cross of the Red Fife with Ladoga, has taken the lead in productiveness, showing an average yield for 6 years of 33 bu. and 53 lbs. per acre, or an increase of 1 bu. and 28 lbs. over Red Fife. Laurel, a cross of Red Fife with Gehun, has produced even higher yields, but has been under observation only 3 years.

The best results for earliness were obtained from a cross with Onega, a variety from the most northern wheat district of Russia, and Gehun, which comes from a high elevation in the Himalayan Mountains. Two of the resulting crosses, Early Riga and Harold, ripen a week earlier than Red Fife, but the grain is small and the yield only medium. In the author's experience any marked gain in earliness has usually involved a reduction in the weight of the crop.

In a recent experiment Red Fife was fertilized with pollen from the large-grained *Triticum polonicum* for the purpose of producing a variety with a larger kernel than the ordinary grain. The progeny thus far obtained has shown remarkable variation.

Distinct hybrids of 2-rowed and 6-rowed barleys produced at the Experimental Farms are described in a general way and the work with oats and peas is mentioned.

The structure of the corn kernel and the composition of its different parts, C. G. HOPKINS, L. H. SMITH, and E. M. EAST (*Illinois Sta. Bul. 87, pp. 77–112, figs. 4*).—This bulletin contains additional data relating to the improvement in the chemical composition of the corn kernel, as treated in previous bulletins (E. S. R., 11, p. 633; 14, p. 855). The chemical and physical composition of the different parts of the corn kernel was further studied and the additional results, together with some of the data previously obtained, are here given in tabular form and discussed.

The authors consider the corn kernel to consist of the following 6 physical parts: Tip cap, hull, horny gluten, horny starch, white starch, and germ. The tip cap is described as covering the tip or base and comprising about 1.5 per cent of the grain, and the hull as the very thin outer coat, comprising about 6 per cent of the kernel and containing a lower percentage of protein than any other part of it. The horny

gluten lies immediately under the hull, comprises from 8 to 14 per cent of the grain, and is more abundant in the kernels with a high protein content. This part contains from 20 to 25 per cent of protein, and is the richest in this substance of all the parts of the kernel.

The horny starch, the chief substance in the sides and back of the kernel, comprises about 45 per cent of ordinary corn, but the percentage is much higher in corn with a high protein content and lower in corn with a low protein content. This part of the kernel is rich in starch, and contains about 10 per cent of protein. Owing to the large proportion of the kernel which it constitutes, it contains a greater total amount of protein than any other part. The white starch, occupying the center of the crown end of the kernel and usually partially surrounding the germ, comprises about 25 per cent of the kernel, being less in high-protein corn and greater in low-protein corn. It contains only from 5 to 8 per cent of protein. The germ comprises about 11 per cent of the kernel and varies according to the oil content, constituting a larger proportion in high-oil corn and a smaller proportion in low-oil corn. In oil the germ ranges from 35 to 40 per cent, and furnishes from 80 to 85 per cent of the total oil content of the kernel. Corn high in protein is described as containing a large proportion of horny gluten and horny starch, and a correspondingly smaller proportion of white starch. In corn of a high protein content the horny parts comprise over 60 per cent of the kernel and contain about 80 per cent of the total protein present.

In 1900 comparison was made between 2 strains of corn bred for 4 years for high oil and low oil content, respectively. The plants representing the 2 strains were grown this season under identical conditions. The results show only an average difference of 1.97 per cent in the oil content and of 0.18 per cent in the protein content. These figures show that there is less than 5 per cent of a perfect correlation between the oil and protein. From these and previous results it is concluded that as the percentage of protein increases in corn, the starch decreases and the oil content remains practically unchanged, and that the selection of high-protein seed corn should be governed by a large proportion of horny parts, and of high-oil seed corn by a large proportion of germ.

The chemical composition of 4 strains of pedigreed corn compared for high and low protein and high and low oil was determined from samples of 10 ears each taken from the crop of 1902 and representing the seventh generation. The protein content of the low-protein ears varied from 6.36 to 7.9 per cent, with an average of 6.71 per cent, while the protein content of the high-protein ears varied from 13.98 to 15.01, with an average of 14.44 per cent. The average oil content of the low-protein ears was 4.21 per cent and of the high-protein ears 4.93 per cent.

A slight correlation was noticed to exist between the average percentages of protein and germ, but there were some marked exceptions. In one case an ear with 6.37 per cent of protein contained 9.53 per cent of germ, while in another instance an ear with 14.74 per cent of protein contained 9.51 per cent of germ. One of the lowest protein ears with a protein content of 6.48 per cent contained 10.79 per cent of germ, while the highest protein ear, with 15.01 per cent of protein, contained only 9.82 per cent of germ. The results of analyses of the low-oil and high-oil ears show an average for the low-oil corn of 2.52 per cent of oil and 9.98 per cent of protein, and for the high-oil ears of 7 per cent of oil and 11.31 per cent of protein. In these figures the slight correlation between oil and protein again becomes apparent, the high-oil corn containing nearly 3 times as much oil as the low-oil corn, but being less than one-seventh richer in protein. A very marked correlation between oil and germ is shown in the results obtained in studying the oil and germ in low-oil and high-oil corn. The 10 low-oil ears contained an average of 2.52 per cent of oil and 7.74 per cent of germ, and the 10 high-oil ears an average of 7 per cent of oil and 13.84 per cent of germ.

The effect of breeding in changing the composition of the different physical parts of the kernel is shown by the fact that the germs from the low-oil corn contained about 25 per cent of oil and those from the high-oil corn nearly 42 per cent, while the endosperms from the low-protein ears contained less than 6 per cent of protein and those from the high-protein ears nearly 14 per cent. Results further show that breeding for high or low protein produced no marked effect upon the ash content or the oil content of either the germs or the endosperms, and that it only slightly influenced the protein content of the germs. As calculated on the basis of 100 lbs. of corn, there was a maximum difference of only 0.75 lb. of protein in the germs from 100 lbs. of low-protein and high-protein corn, and a difference of 7.06 lbs. of protein in the endosperms.

The composition of parts of the corn kernel separated by hominy mills is compared with the composition of these same parts separated by hand.

Field experiments with maize, G. L. Sutton (*Agr. Gaz. New South Wales, 14 (1903), No. 7, pp. 656–664, figs. 19*).—Descriptions of 25 varieties of corn tested at the Hawkesbury Experimental Farm in 1902 and 1903 are given. The details enumerated have reference mainly to the ear. A number of the varieties were imported from the United States.

Why popcorn pops, M. I. Wilbert (*Amer. Jour. Pharm., 75 (1903), No. 2, pp. 77–79*).—Observation and experiment led the author to the conclusion that the popping of popcorn is caused by the expansion of moisture in the starch cells. It was found that old and dry corn did not pop readily. Such corn "will at best only split open from a number of cells near the center of the corn kernel. If the application of heat be made slowly, it is possible to dry the kernels of corn, parch, and even char them without rupturing the outer coat in any way."

It was also noted that "at the base of the kernels, or at the point of attachment to the cob, the cells are less compact and are seldom, if ever, ruptured by the generated steam. It is from this point too that the kernels of corn appear to dry most rapidly." The bearing of this point on the theory that popping is caused by an explosion of steam is found in the fact that "popcorn invariably bursts first at the densest portion of the kernel, and never at or near its base or point of attachment."

When old and dry corn was soaked for 12 hours and then dried for an equal time it did not pop well. If kernels were allowed to dry on the surface for 24 hours longer "the resulting kernels of popped corn were not only very large, light and flaky, but had absolutely no suggestion of toughness."

As regards the loss of weight in popping, the author noted that 100 grains of whole or unpopped corn weighed 13 gm., the same quantity partially popped 11 gm., fully popped 9.2 gm., and dried and parched 7.5 gm.

The author states that studies should be made of the changes in cell structure caused by popping, as well as determinations of the amount of material rendered soluble by the heating of the starch.

Cotton in the United States, Y. Henry (*Le coton aux États-Unis. Paris: Augustin Challamel, 1903, pp. 61, fig. 1, maps 2*).—A brief review of cotton culture in the United States, including descriptions of a number of varieties grouped according to the period of their maturity.

Experimental investigations on hemp, M. Molliard (*Bul. Soc. Bot. France, 50 (1903), No. 2, pp. 204–213*).—The influence of the size, number, and weight of the akenes on crop production of hemp is shown, as well as the effect of soil, humidity, light, etc., on the growth and seed production. The effect of the weight of seed on the sexuality of the plants was investigated, and while the weight of the seed seemed to have an influence on determining the sex of the plants, the results obtained were not sufficiently marked to warrant generalization in this respect.

Pasture and forage plants for South Dakota, E. C. Chilcott (*South Dakota Sta. Bul. 81, pp. 1–26*).—This bulletin discusses in a popular manner the culture and

uses of corn, saccharine and nonsaccharine sorghums, rape, oats and peas, sand vetches, spurry, millet, winter rye, and root crops in South Dakota. In connection with this discussion some of the results obtained at the station with these crops during the last 10 years are briefly reviewed. Directions are given for the extermination of weeds in pastures by sheep, and a scheme of cropping is suggested which it is believed would furnish green forage continuously throughout the season.

Of all the grasses grown for pasture at the station, *Bromus inermis* is reported as having given the best results. In 1896 experiments were made with corn and sorghums grown for silage and for seed. The yields, together with the quantity of seed sown per acre of corn, Kafir corn, Jerusalem corn, amber cane, and yellow millo maize are tabulated. Amber cane stood first, with a yield of 6,850 lbs. of green forage per acre, and Jerusalem corn ranked last, with a yield of 3,075 lbs., while corn gave about an average between the two.

The results in the test for seed production were largely in favor of corn as compared with Kafir corn and Jerusalem corn. Early Essex and Victoria rape were found equally good. A mixture of 2 bu. of vetch and 1 bu. of oats sown at the rate of 120 lbs. per acre produced 18,440 lbs. of green forage per acre. Vetch grown alone yielded about 5 tons of green forage, which amounted to 2,532 lbs. of hay per acre. Spurry, 7 weeks after sowing, yielded 18,680 lbs. of green forage, or 2,920 lbs. of dry feed per acre. Three varieties of winter rye sown in the fall came through a severe winter in almost perfect condition.

Some native and exotic grasses at Bathurst Farm, R. W. PEACOCK (*Agr. Gaz. New South Wales, 14 (1903), No. 7, pp. 579–583, figs. 11*).—The adaptability of different grasses to Australian conditions as observed at the farm is discussed and the value of each species is briefly noted.

Nitrate of soda and muriate of potash as top-dressing for grass land, C. D. WOODS (*Maine Sta. Bul. 94, pp. 107, 108*).—A brief account is given of an experiment in applying these substances in solution by means of an automatic spray pump, such as is used for spraying potatoes. The season was unfavorable and the potash seems to have been of no benefit, but the nitrate of soda was probably profitable.

Hydrocyanic acid in fodder plants, J. C. BRÜNNICH (*Jour. Chem. Soc.* [*London*], *83 (1903), No. 488, pp. 788–796*).—The author made a study of the conditions under which hydrocyanic acid is formed in sorghum and other plants. It was found that the amount of hydrocyanic acid gradually diminishes as the crop matures, but it was impossible to state at what age the crop becomes absolutely safe for use. As a rule, however, it may be assumed that sorghum is safe for fodder as soon as the seeds are fully developed. Drying sorghum does not remove the hydrocyanic acid. The amount of poison appears to be increased by the use of heavy nitrogenous fertilizers. A certain amount of the poisonous glucosid was found in corn in various stages until the formation of the cobs, but never in dangerous quantities. The author recommends that all forage plants related to sorghum should be used with discretion in the green or dried state and should not be fed in an immature stage or to animals which have fasted for a long time.

A monograph on rice, C. D. GIROLA (*Monografía del arroz. Buenos Ayres: Min. Agr., 1899, pp. 65, figs. 5*).—After giving brief general notes on the rice plant the author discusses the climatic conditions suitable to the culture of the plant, describes different species and varieties under cultivation, and gives directions for the culture and harvesting of the crop with special reference to Argentine Republic. The composition of a number of varieties is shown in tables. The culture of rice in different countries is briefly noted.

Variety tests with rye, E. SIERIG (*Deut. Landw. Presse, 30 (1903), No. 72, p. 621*).—Eight varieties were under test; the yields are given and the growth of the different varieties is compared. An application of 100 kg. nitrate of soda per hectare seemed to be the maximum utilized by Hanna, Petkus, Pirna, and Selchow, while

Schlansted, Hadmersleben, Klosterroggen, Prof. Heinrich, and Probstei varieties were apparently capable of using more than double that quantity.

It was observed that the weight per hectoliter, as well as the weight per 1,000 grains, decreased quite regularly with the increase of the quantity of nitrate of soda applied. The best results were obtained from Petkus rye, which gave a financial return of 71.65 marks more per hectare than the variety ranking last.

Progress of the beet-sugar industry in the United States in 1902, C. F. Saylor (*U. S. Dept. Agr. Rpt. 74, pp. 1–140, pls. 5*).—This report is similar to those for previous years (E. S. R., 14, p. 350). It, here considered, reviews the prospects of the beet-sugar industry, enumerates its collateral and indirect benefits, points out the results of experience with reference to the culture of beets and the building of factories for the manufacture of beet sugar, and discusses the improvement in factories and farm conditions. The value and uses of sugar-beet pulp are considered at some length. The Brussels conference and countervailing duties are discussed, and the history of the industry in the United States is outlined. The condition of sugar-beet culture and of beet-sugar manufacture is noted by States and summarized as follows:

Number of factories, with their capacity for working beets and producing sugar for 1903, by States.

State.	Number of factories.	Daily capacity in beets.	Annual capacity for production of sugar.
		Tons.	*Tons.*
Michigan	21	13,100	115,542
California	8	10,200	89,964
Colorado	9	6,250	55,125
Utah	7	3,350	29,547
Nebraska	3	1,200	10,584
New York	2	1,200	10,584
Wisconsin	1	500	4,410
Minnesota	1	350	3,087
Ohio	1	350	3,087
Oregon	1	350	3,087
Washington	1	350	3,087
Total	55	37,200	328,104

Three of the factories in Utah are slicing stations only. Statistics of the production of sugar beets and the manufacture of beet sugar, collected from the factories, and other statistical data with reference to consumption, imports, exports, etc., are presented. Selected farm results in different States, showing the possibilities of sugar-beet culture for the respective localities, are also reported.

In 1902, 1,895,812 tons of beets were worked, costing on an average $5.03 per ton and producing a total of 436,811,685 lbs. of sugar.

Single-germ beet balls and other suggestions for improving sugar-beet culture, T. G. Palmer (*U. S. Dept. Agr. Rpt. 74, pp. 141–152*).—This article discusses the financial returns in sugar-beet culture, the use of machines for planting beet balls and for pulling and topping beets, the cultivation of the crop, the effects of sugar-beet culture on the land and the succeeding crop, and the lowering of the cost of producing sugar. Special consideration is given the subject of multiple-germ and single-germ beet balls. The author points out that the use of single-germ beet balls would very materially reduce if not practically eliminate the labor of thinning beets.

Sugar-beet seed: Its importance and production, J. E. W. Tracy (*U. S. Dept. Agr. Rpt. 74, pp. 153–156*).—The quantities of sugar-beet seed used and produced in the United States are estimated and the history of domestic seed production, together with the condition of the industry at the present time, is briefly reviewed.

Experiments in the culture of the sugar beet in Nebraska, T. L. Lyon and A. T. Wiancko (*Nebraska Sta. Bul. 81, pp. 13, fig. 1*).—The cooperative experiments

here described were made in 1902 and are in part a continuation of previous work (E. S. R., 14, p. 34). About 200 acres of deep, friable loam soil, uniform in physical character and fertility, were devoted to the experiments.

The results of a test of 28 varieties from imported and home-grown seed apparently showed that the quality of the seed is more important than the variety. The home-grown seed compared very favorably with the imported seed, which gave rather irregular results. Contrary to previous results barnyard manure applied this season at the rate of 22 tons per acre seemed to have no effect on the yield and quality of the crop. All beets grown where salt was used as a fertilizer were relatively good in quality and showed no difference in susceptibility to disease as compared with beets from other plats in this experiment.

The results from early-planted beets were decidedly better than from late-planted beets. This season, which was much wetter and cooler than normal, rather deep cultivation gave the best results. In previous years cultivation about 3 in. deep was most profitable. Deep hand-hoeing when the plants were 4 to 5 in. high gave a considerable increase in yield. Beets grown on weedy fields showed a low sugar content. In the series of cultivation tests the plat on which cultivation was continued late into the season after the leaves were full grown produced the largest tonnage per acre The beets on 1 plat in these tests were stripped of half of their leaves on July 8 when they had reached their full size. It was found that while the beets on the other plats were affected with leaf spot to the extent of about 50 per cent, the plat from which half the leaves had been stripped showed only about 30 per cent. Breaking off the leaves did not injuriously affect the yield and quality of the crop.

Alkali lands and sugar-beet culture, III, H. C. Myers (*Jour. Soc. Chem. Ind., 22 (1903), No. 13, pp. 782–785, figs. 7*).—A study of alkali soils in Utah and Colorado, with special reference to sugar-beet culture, is presented. An examination of Utah soils producing beets of low purity showed that the surface foot of soil contained very little alkali and that the low purity was due to the injurious salts brought up from below the surface foot by improper irrigation. In another instance it was found that the average purity of beets on soil containing 1,880 lbs. of alkali per acre in the surface foot was 81.3, and that when the alkali content was reduced to 376 lbs. the purity rose to 84.9. The alkali content of the second foot of soil as determined in this work seemed to vary between 3,120 and 5,600 lbs. per acre. The percentage of carbonates, nitrates, sulphates, and chlorids found in the surface foot, and the composition of white alkali are shown in tables.

In studying the bottom lands near Greeley, Colo., the quantity of alkali removed from the soil by a beet crop was determined to be 322.5 lbs per acre, of which 134.3 lbs. were removed in the tops. Investigations on the upland soils in this same vicinity are also reported. Analyses of virgin desert upland soils and of soils under cultivation for 30 years and similarly situated are compared. The cultivated soil had produced wheat, potatoes, and alfalfa in rotation without fertilization. The analysis of this soil was made after the first crop of sugar beets had been harvested. In both soils the nitrates, phosphates, and humus were low, while potash averaged well in the virgin soil and showed a marked increase after 30 years of cultivation. The percentage of humus was also highest in the cultivated soil. The sugar beets produced on this soil were high in sugar content and purity. The treatment of a crop of sugar beets injured by hail and its recovery are recorded in this connection.

The following plants collected by the author on virgin alkali soil in Utah are recorded as indicators of alkali: *Artemisia tridentata, Distichlis spicata, Atriplex confertifolia, Suæda torreyana, Atriplex canescens, Lycium andersonii, Gutierrezia euthamiæ, Amaranthus albus, Bigelovia graveolens.*

The sugar industry of the United Provinces of Agra and Oudh, S. M. Hadi (*Allahabad: Govt. Printer, 1902, pp. 112, pls. 10, figs. 58*). This book treats of the species and varieties of sugar cane grown in these Provinces and of the methods employed in the cultivation of the crop and the manufacture of sugar.

The manufacture of cane sirup, H. H. HARRINGTON (*Texas Sta. Bul. 68, pp. 20, figs. 12*).—After briefly noting the manufacture of glucose sirup this bulletin discusses the culture of sugar cane for sirup making and describes the manufacture of the product. A plan of a sirup mill is shown. The chemical composition of cane, sorghum, maple, and glucose sirups is given in a table.

The cultivation and treatment of the Kumara (sweet potato) by the primitive Maoris, WALSH (*Trans. and Proc. New Zealand Inst., 35 (1902), pp. 12–24*).—The methods of cultivating the sweet potato (*Ipomœa chrysorrhiza*) grown by the New Zealand natives before the introduction of European foods are described, as well as methods of harvesting, storing, and cooking.

Tobacco, O. J. A. COLLET (*Le tabac. Paris: Augustin Challamel; Brussels: Falk, 1903, pp. 282, pls. 30, figs. 34*).—A detailed description of the tobacco industry on the eastern coast of Sumatra, with special reference to Deli.

Fertilizer experiments with tobacco in Japan, M. LEHMANN (*Landw. Vers. Stat., 58 (1903), No. 5–6, pp. 439–470; abs. in Deut. Landw. Presse, 30 (1903), No. 74, p. 643*).—Fertilizer experiments conducted during 1900 and 1901 are described and the results and conclusions reported. The tobacco plants under investigation were grown in wooden frames and pots. The work will be repeated to determine whether the results thus far obtained will be confirmed by the results of future tests.

The tobacco plants seemed to be more in need of nitrogen than of either potash or phosphoric acid. The nitrogen was required in equal degree by all parts of the plant, while potash was apparently mainly utilized by the leaves and roots and phosphoric acid by the stems. After nitrogen, potash was most needed and its effect was especially marked immediately after transplanting. The best results with the different nitrogenous fertilizers applied were obtained with nitrate of soda, but satisfactory returns were also obtained where sulphate of ammonia and dried blood were used. The tobac o fertilized with dried blood showed an especially good glow. Of the various potash fertilizers, "martellin" seemed to be decidedly the best, followed by wood ashes, nitrate of soda, and carbonate of potash in the order named.

Liming the soil appeared advantageous to the plants during early development, but later on its influence seemed to cease and the difference between plants in limed and unlimed soil gradually disappeared. It is, however, recommended that the lime supply of the soil be not allowed to become exhausted, because a strong development in the early stages of growth gives to the plant greater resistance to injurious agents.

Soy-bean cake was apparently more economical as a tobacco fertilizer than rape cake, and this is considered of importance to Japanese agriculture, because soy-bean cake is much the cheaper. The glow of tobacco fertilized with soy-bean cake was very good. "Martellin" and carbonate of potash also seemed to have a good effect on the glow, while the chlorids and sulphates apparently reduced or totally destroyed it. Very heavy applications of fertilizers are considered injurious on account of the resulting high-water content of the leaves and stronger development of the roots and stems at the expense of the leaves. From 0.5 to 2 per cent of perchlorate in nitrate of soda did not seem to act injuriously. The results indicate that the perchlorate in this proportion had a favorable effect on the development of the leaves and especially of the roots.

Description of wheat varieties, C. S. SCOFIELD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 47, pp. 19, pls. 7*).—This bulletin presents a form on which are given in regular order a list of adjectives considered of the most importance in describing a variety of wheat, together with an explanation of all the listed terms. The adjectives proposed for use in variety descriptions are grouped under the following heads: Young stool; half-grown plant; mature plant; head (field notes); head (laboratory notes); awns; spikelet; grain; milling qualities; general characteristics.

The stooling of wheat, F. ANTONIS (*Ann. Sta. Agron. Oise [France], [illegible], No. [illegible], pp. 11–13*).—A discussion of the subject which chronicles an instance of a stool of wheat yielding 4,875 grains from one grain of seed.

HORTICULTURE.

Report of the assistant in horticulture, E. Nelson (*Wyoming Sta. Rpt. 1903, pp. 54–57*).—A brief outline is given of the horticultural work of the station during the season of 1902. Canaigre seed planted at the station germinated and made a fair growth during the season. Plants grown from roots remained green until very late in the fall, but those allowed to remain in the soil over winter were killed. A native form of flowering currant, producing yellow berries of fair size and valued for culinary purposes, has been secured and planted with a view to its domestication and improvement. Burpee Quarter Century tomato is reported as giving good yields.

New vegetables, G. Wythes (*Gard. Chron., 3. ser., 34 (1903), No. 876, pp. 250–253, figs. 6*).—New varieties of cabbage, vegetable marrow, artichoke, and beans are illustrated and described. A pear-shaped custard marrow was obtained by crossing the bush with the old custard variety. The plants have a trailing habit and fruit freely.

The variety Early Gem cabbage is a very small early variety, having a single row of outer leaves. It was obtained by crossing Ellam with Sutton Little Gem. The variety of cabbage called St. Martin was originated with the object in view of securing a perfectly hardy cabbage for use from November to April. It was obtained by crossing the Rosette Colewort with the Christmas Drumhead cabbage. The plant is dwarf and the heads roundish and of medium size. The new long white artichoke described was obtained by means of rigid selection for several seasons.

The dwarf bean Progress was obtained by crossing Mohawk or Six Weeks with Canadian Wonder. These beans yield produce from June to October when properly handled. They are not considered vigorous enough to withstand red spider and drought. The dwarf bean Early Favorite was obtained by crossing Mohawk and Veitch Ne Plus Ultra. It is considered especially valuable for forcing and also for cultivation in the open ground. It is especially early and a good cropper. Another variety obtained from a batch of seedlings which has been given a name is Wythes Early Dwarf, secured as a result of crossing Syon House with Mohawk.

Vegetables and fruits at the Upper Peninsula Substation, L. M. Geismar and C. D. Smith (*Michigan Sta. Spec. Bul. 20, pp. 25–52*).—An account is given of the growth during the seasons 1901 and 1902 of a number of varieties of turnips, carrots, parsnips, kohl-rabi, Brussels sprouts, cabbage, cauliflower, radishes, lettuce, onions, squashes, cucumbers, bush beans, sweet corn, tomatoes, peas, spinach, garden beets, celeriac, celery, pumpkins, mangels, herbs, sunflowers, musk and watermelons, orchard fruits, strawberries, gooseberries, currants, blackberries, raspberries, and cherries. Descriptive notes of a number of the more promising varieties are usually given for each crop.

It has been found that carrots, parsnips, and salsify can be safely left in the ground over winter at the station and harvested the following spring in perfect condition. Experiments in warding off frosts by the use of extensive fires made with logs and stumps resulted in keeping the temperature 2° above the surrounding uninfluenced portions of the orchard. The insect *Basilarchia arthemis* was found injuring the buds of apples.

Vegetables, V. H. Davis (*Jour. Columbus Hort. Soc., 18 (1903), No. 3, pp. 95–97*).—Notes are given on the growth in the Ohio University gardens of strawberries and a number of vegetables. From 1 acre produce was sold as follows: Cabbage $68.75, peas $61.30, onions $50.22, radishes $13, spinach $3.80, corn $20; total, $215.07. Asparagus which had been treated with sodium nitrate the preceding summer showed a marked increase in strength of growth as a result of the application. Magnus is preferred as a market tomato, and Stone for canning. The author believes that it will pay to train early tomatoes if for no other reason than to facilitate gathering.

Vegetables for profit, T. W. Sanders (*London: W. H. & L. Collingridge, 1903, pts. 1, pp. 93, figs. 22; 2, pp. 101, figs. 30; 3, pp. 96, figs. 25; 4, pp. 116, figs. 33*). This is a

series of small handbooks designed to meet the requirements of market gardeners in England. Part 1 is devoted to green crops—broccoli, Brussels sprouts, cabbage, cauliflower, herbs, etc.; part 2 to root crops—potatoes, onions, beets, parsnips, carrots, turnips, and other roots and tubers; part 3 to asparagus, beans, peas, rhubarb, sea kale, marrows, etc.; and part 4 to mushrooms, cucumbers, salads, tomatoes, etc. Each book contains detailed information on planting, cultivation, and harvesting the various crops which it purports to treat of, and, in addition, describes the insect pests and fungus diseases affecting them, giving suggestions as to methods for their control. Recipes are frequently included as to methods of cooking the different vegetables.

Vegetables and fruits of Madagascar (*Légumes et fruits à Madagascar. Paris: Augustin Challamel, 1903, pp. 40, pls. 4, fig. 1*).—An account is given of a large number of tropical and subtropical fruits grown on the east side of Madagascar, with an account of the installation of a vegetable garden and orchard at the Government experiment station.

Storage of some common vegetables (*Iowa Agr., 3 (1903), No. 6, pp. 176–178*).—Directions are given for the winter storage of potatoes, root crops, cabbages, onions, squashes, and celery.

Cabbage: Varieties, fertilizers, B. C. PITTUCK and S. A. MCHENRY (*Texas Sta. Bul. 69, pp. 23–48*).—This bulletin presents in text and tabular form the results of tests of a number of varieties of cabbage at the Beeville Substation for the years 1898–1902. The yields obtained at Beeville and in cooperation with farmers in 5 different localities with 5 different fertilizer formulas are also included. No definite conclusions have been drawn from this work.

The method of building reservoirs at the station and of applying water to cabbages is given in some detail. Water is first applied by opening furrows close to the drill. When the plants get older a large flat sweep is used to level the middles and spread the water. From 20,000 to 40,000 gal. of water is applied per acre before transplanting, and about 35,000 gal. at each irrigation thereafter. The cost of irrigation varies from 2 to 8 cts. per 1,000 gal. of water applied. The crop is cultivated from 6 to 9 times during the season and hoed at least once. The harlequin cabbage bug is controlled by means of the blow torch. In shipping cabbages in carload lots good ventilation has been secured by erecting a triangular shaft 2½ ft. wide and 3½ ft. high, and running the entire length of the car. This shaft is latticed by use of 1 by 3 in. stuff, using about 6 to the side. The cost of growing an acre of cabbages to maturity is estimated at $12.85 per acre.

Dandelions, W. M. MUNSON (*Maine Sta. Bul. 95, pp. 109–113, figs. 7*).—The author calls attention to the injurious effects to lawns caused by cutting off dandelions a little below the crown early in spring. Dandelions thus mutilated send up from 2 to 6 new crowns and soon completely infest a lawn. Some illustrations are given showing seedlings of the common dandelion and of the plants developed from root cuttings and from cutting off old roots.

Brief notes are also added on the cultivation of dandelions for market. For this purpose it is recommended that seed be sown early in spring in drills 12 to 15 in. apart and covered ¼ to ½ in. deep. Cultivation is the same as for carrots. Plants should be partially blanched by placing a covering of boards or boughs over the rows. French Garden and the Improved Thick Leaved are considered the most important varieties.

Ginseng, W. M. MUNSON (*Maine Sta. Bul. 95, pp. 117–120, figs. 4*).—Popular information is given on the nature and culture of ginseng. The author does not encourage the culture of ginseng in Maine.

Experience with ripening tomatoes after frost (*Rural New Yorker, 62 (1903), No. 2799, p. 658, fig. 1*).—After a frost which killed tomato leaves, but did not injure the fruit, about 600 bu. of green tomatoes were gathered and placed some in a cold frame and some in a storage room of a canning factory. They ripened up well. But few rotted. Most of them were solid when ripe and made a fair canned product.

The influence of electricity on vegetation, F. PAULIN (*Ann. Sta. Agron. Oise* [*France*], *1903, No. 35, pp. 35–40*).—In the work conducted electricity was conveyed to the plants by means of urpight rods placed in the ground with a network of wire connecting them below, and placed deep enough in the ground not to interfere with cultivation. Under the influence of the electricity thus generated the yield of potatoes was increased 50 per cent. Cauliflowers matured a month earlier than plants not under the influence of electricity. The yield of beans and peas was nearly doubled. Figs matured perfectly out of doors, as did also grapes for wine.

In another experiment 50 tomato seeds subjected to the influence of electricity produced 45 plants, while 50 other seeds not thus treated gave but 35 plants. With another variety 49 seeds subjected to electricity produced 45 plants, while 49 untreated seeds produced only 33 plants. It is stated in this connection that no difference was noticed in the after-growth of tomato plants whether the seed had been subjected to electricity or not. It is also stated that the seed not subjected to electricity was sown dry, while the other seed had been moistened.

Preliminary report on the root and stem development of leaf cuttings, and its importance in plant reproduction, H. LINDEMUTH (*Gartenflora, 52* (*1903*), *No. 18, pp. 479–485*).—The author discusses the propagation of plants from leaf cuttings, and gives a table showing the length of time required for the rooting of some 28 species of plants propagated by leaf cuttings. A list is also given of 13 species which could not be propagated by leaf cuttings. The author states that with the citrus leaf cuttings have often rooted, but in his experience never produced stems.

Orchard cover crops in Delaware, C. P. CLOSE (*Delaware Sta. Bul. 61, pp. 32, figs. 9*).—This bulletin contains an account of the seeding, growth, and comparative value of a large number of different plants and combinations of plants as orchard cover crops on different soils in Delaware. The work was begun in 1901 and the results secured during 2 seasons are reported upon. The weight of the top growth and the root growth to a depth of 12 in. of the different crops grown at the station was determined. The tops and roots were analyzed and the total amounts of nitrogen, potash, and phosphoric acid in each are recorded. The moisture content of the soil in which the cover crops grew, as compared with cultivated soil alongside, was also investigated. All these matters are reported in considerable detail, the behavior of each crop or combination of crops in each of the different localities for each of the 2 years being noted under separate headings.

An idea of the growth and fertilizing value of several of the more prominent crops is shown in the table below. These crops were seeded July 22 at the station on a clay-loam soil and were harvested from November 7 to 22 following:

Weight and composition of orchard cover crops in Delaware.

Crop.	Weight of green tops.	Weight of tops and air-dried roots.	Nitrogen in—		Potash in—		Phosphoric acid in—	
			Tops.	Tops and roots.	Tops.	Tops and roots.	Tops.	Tops and roots.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Cowhorn turnip	11,297	31,819	64.4	109.5	80.3	142.6	14.3	26.0
Rape	26,620	27,484	116.2	161.3	148.2	161.3	41.8	46.9
Crimson clover	18,800	19,213	128.2	134.4	84.0	88.2	59.2	61.2
Red clover	6,909	8,121	69.8	103.0	46.5	56.4	18.9	29.0
Alfalfa	5,430	7,410	54.8	95.2	32.2	41.7	13.1	21.6
Hairy vetch	13,150	13,750	108.0	121.2	78.4	85.5	22.5	27.2
Cowpeas	5,933	6,327	65.2	69.5	47.4	49.8	16.6	18.9
Soy beans	10,952	11,708	130.9	140.2	46.2	48.0	37.8	40.2

The root growth to depths of 8 and 12 in., respectively, of some of the more important crops was determined. The weight of the roots of crimson clover in the first 8 in. of soil was 381 lbs., of red clover 1,185 lbs., of alfalfa 1,972 lbs., of hairy vetch 584 lbs., of cowpeas 301 lbs., and of soy beans 717 lbs. In the next 4 in. of soil

there was found 32 lbs. of roots of crimson clover, 27 lbs. of red clover, 8 lbs. of alfalfa, 16 lbs. of hairy vetch, 93 lbs. of cowpeas, and 39 lbs. of soy beans. These figures show that with all these plants by far the greatest amount of roots is found in the first 8 in. of soil.

Some of the crops which have proved most satisfactory at the station are hairy vetch, rye, crimson clover, alfalfa, and red and mammoth clovers. Other crops that were used were cowhorn turnips, dwarf Essex rape, Egyptian clover (Berseem), cowpeas, soy beans, velvet beans, Australian saltbush, and Canada field peas. These were used alone and in various combinations. One of the best combinations consisted of hairy vetch 40 lbs. and rye 30 lbs. per acre. The amount of seed to use per acre for different crops in combinations is given by the author as follows: "Rye 1 to 1½ bu.; cowhorn turnips 1 to 2 lbs.; dwarf Essex rape 8 to 10 lbs.; red, mammoth, or crimson clover 15 to 20 lbs.; cowpeas 90 lbs.; soy beans 90 lbs.; hairy vetch 40 to 50 lbs.; alfalfa 30 lbs.; hairy vetch 40 lbs. and rye 30 lbs.; hairy vetch 20 lbs. and cowpeas or soy beans 45 lbs.; hairy vetch 20 lbs. and turnips 12 oz.; hairy vetch 20 lbs., crimson clover 8 lbs., and turnips 8 oz.; hairy vetch 20 lbs. and red, mammoth, or crimson clover 8 lbs.; turnips 8 oz., rye 20 lbs., and red, mammoth, or crimson clover 4 lbs.; turnips 12 oz. and crimson clover 8 lbs.; turnips 12 oz. and soy beans or cow peas 40 lbs.; dwarf Essex rape 4 lbs. and rye 1 bu.; rape 4 lbs., soy beans or cow peas 40 lbs., and rye 20 lbs.; alfalfa 15 lbs. and red, mammoth, or crimson clover 7½ lbs.

"Many other combinations may be used successfully. The object should be to use such a mixture of crops that a part, at least, shall live over winter. A few of the combinations above contain all fall crops, and for that reason are not so desirable as though they contained a part of those that live through the winter and grow in the spring."

The soil moisture determinations made indicate that cultivated soils, during periods of dry weather, contain considerably larger quantities of moisture than soils seeded to cover crops, the variations ranging from 1 to 11 per cent in favor of the cultivated areas in these experiments.

The fertilization of apple blossoms, H. S. PEART (*Canad. Hort., 26 (1903), No. 9, pp. 361–363*).—The author covered a certain number of apple blossoms on trees representing 29 different varieties with paper bags. Only 8 of the varieties produced any fruit at all under the bags, and only 1 or 2 fruits developed from the covered blossoms on any one tree. The varieties thus showing a certain amount of self-fertility were Alexander, Baldwin, Chenango, Early Harvest, Greening, Holland, Twenty Ounce, and Ontario. Only 8 of the remaining 21 varieties which bore no fruit when self-fertilized under the paper bags are named in the account. These are: Blenheim, Ben Davis, Canada Red, King, Mann, Fameuse, Spy, and Ribston.

A discussion is given of the desirability of intermixing varieties in the orchard which shall bloom at about the same period. It is stated that the Spy is in full bloom at the same time as Ben Davis and Princess Louise.

The grading and packing of apples, M. A. McNEILL (*Canad. Hort., 26 (1903), No. 9, pp. 364–366*).—A general discussion of this subject, dealing particularly with the requirement of the Fruit Marks Act of the Dominion of Canada of 1901, which designates the marks which must be used throughout the Dominion of Canada for different grades of apples. Under this act apples of best quality are marked No. 1, or XXX; second quality No. 2, or XX, and third quality No. 3, or X. The last two grades of apples are not defined, but apples that are graded as No. 1 must be well-grown specimens of one variety, sound, of nearly uniform size, of good color for the variety, of normal shape, and not less than 90 per cent free from scab, worm holes, bruises, and other defects, and properly packed.

Investigations on the structure of the grape berry, A. BONNET (*Ann. École Nat. Agr. Montpellier, n. ser., 3 (1903), No. 1, pp. 58–102, pls. 3, figs. 18*).—This gives an

account of the anatomical structure of the grape berry at different stages of maturity, and is illustrated by a large number of drawings. Detailed accounts are given of the structure of a large number of Vinifera varieties and of the structure of the skin of a number of American species. Great differences were found in the thickness of the skin of Vinifera and American species. For instance the species *Vitis coriacea* had a thickness of 9.9 μ, *V. berlandieri* 8.5, *V. æstivalis* 8.3, *V. cinerea* 8, *V. rubra* 7.8, *V. labrusca* 7.6, *V. monticola* 6.7, *V. riparia* 6.5, *V. arizonica* 5.7, *V. rupestris* 4.6, and *Vinifera* 3.8.

A discussion is given of the relation between the structure of the skin and the resistance to cryptogamic diseases.

The book of the peach, H. W. Ward (*London: The Walter Scott Pub. Co., Ltd., 1903, pp. 113, pl. 1, figs. 28*).—This is a practical handbook on the cultivation in Great Britain of peaches under glass and out of doors against walls. The work takes up the details of building and managing peach houses, trellising peach trees against walls, pruning and training, packing and marketing, and the control of the injurious insects and diseases affecting peaches.

Orchard studies. VII, Notes on varieties of Domestica plums, W. B. Alwood and H. L. Price (*Virginia Sta. Bul. 134, pp. 40–46, figs. 3*).—Descriptive notes are given on 13 varieties of plums. The following varieties are recommended: *Medium early*—Bradshaw and Washington; *Mid-season*—Yellow Egg; *Medium late*—Gueii and Naples; *Late*—Agen, Grand Duke, Shropshire, and Reine Claude.

Crossbred fruits, W. Saunders, (*Connecticut State Bd. Agr. Rpt. 1902, pp. 129–133*).—An account is given of the improvement of certain fruits by crossbreeding and selection in Canada and elsewhere during recent years. The origin of the Canada and Othello grapes, Ontario apple, and American Wonder pea are noted. The author originated the gooseberries Pearl and Red Jacket, and the grapes Kensington and Emerald. Efforts to cross the blackberry and raspberry have met with but little success. Seed has sometimes been obtained, but it usually failed to germinate, and even when it did germinate the plants were weakly and worthless. A number of apples have been secured by crossing with the Siberian crab, *Pyrus baccata*, which have been found useful in the colder regions of the Northwest.

A failure with root-pruned trees (*Rural New Yorker, 62 (1903), No. 2799, p. 661*).—The writer states that he closely followed the system of close-root pruning in New Jersey in setting out 1,000 peach trees. A drought occurred during the summer and 800 trees died, while the remainder made a very poor growth.

Questions on grafting, L. Daniel (*Rev. Vit., 20 (1903), No. 510, pp. 355–357*).—The author notes an experiment in which Raparia Gloire was grafted with a bud of Siebel 2003, taken from stock which had also been grafted on Riparia the preceding year. The fruit of Siebel 2003 is black, the berries large, and it is a second early sort. As result of this graft a small white grape was obtained whose season of ripening was earlier than that of Madeline, which is considered the earliest grape in that section.

These results are considered to clearly indicate a reciprocal action between stock and scion and to refute, therefore, the conclusion of L. Ravaz, who read a paper at the recent Agricultural Congress in Rome to the effect that the reciprocal action of grapes between scion and stock is null.

On the effects of the graft, L. Ravaz (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 41, pp. 438–442*).—A controversial article in which the value of the evidence cited by L. Daniel on the reciprocal action of scion and stock in grape grafting, noted above, is minimized.

Preservation of fruits by cold storage, L. Loiseau (*De la conservation des fruits par les procédés basés sur l'emploi du froid. Paris: Librairie et Imprimerie Horticoles, 1903, pp. 31, figs. 2*).—An account is given of some experiments in preserving peaches and other fruits in a small refrigerating apparatus. The temperature was kept at

about 0 to 1° C. In one experiment at the end of a month the 600 peaches used were all in good condition. At the end of 35 to 40 days 10 per cent of them had deteriorated, and at the end of 2 months about 75 per cent had deteriorated. Peaches that had been wrapped in tissue paper or wadding did not keep better than those without any wrapping whatever. One of the striking features of the experiment was that peaches submitted to cold storage kept longer after removal than those picked fresh from the trees. Peaches picked from the trees could not be exposed for sale more than 3 days at the maximum without deteriorating, while the refrigerated peaches preserved a good appearance for 6 to 7 days after removal.

Some of the peaches placed in cold storage were harvested 5 to 6 days before maturity. The conclusion drawn from this work is to the effect that for the best results it is absolutely essential that the fruit should be allowed to develop on the tree until it has attained its maximum quality before placing in cold storage. If gathered too green it loses fragrance and quality in cold storage.

Mention is made of an experiment in shipping peaches to New York. Peaches were successfully sent from Havre, France, to New York City without loss of quality.

Cold storage on the farm, J. C. Blair (*Amer. Agr., 72 (1903), Nos. 14, pp. 268–270, figs. 4; 15, pp. 288, 290, figs. 2*).—Details of construction are given for a cold-storage house suitable for farm conditions and costing about $650. Many of the details are brought out in diagrams and plans.

The preservation of fruits, with description of fruit evaporators (*Conservacion de las frutas con descripcion de las evaporizadoras de frutas, etc. Buenos Ayres: Alejandro Reinhold, 1903, pp. 34, figs. 21*).—This pamphlet is devoted largely to descriptions of American and German machinery used in the preparation and evaporating of orchard fruits.

Preservatives in fruit shipping (*Queensland Agr. Jour., 13 (1903), No. 1, p. 31*).—An account of California methods of preserving citrous fruits in shipping. It is stated that there is usually a loss of from 5 to 15 per cent from rot in shipping oranges and lemons and that this can be prevented by fumigating the cars with formaldehyd. The method observed in preserving cars of fruit is to pour 6 oz. of formalin into a pint of water and place the vessel containing the fluid upon a small oil stove so that the water will simmer, after which the car is tightly closed.

Sterilized fruit must, R. Otto (*Proskauer Obstbau-Ztg., 8 (1903), No. 8, pp. 118, 119*).—The author presents the analysis of sterilized and unsterilized fruit must after it had been stored in a cellar for 4½ months. The sterilized must had been heated to 65° C. for a half hour. The chief difference in the analyses was in the sugar content. The total sugar in unsterilized must was 10.63 per cent and in the sterilized 10.71 per cent. The invert sugar of the unsterilized must was 6.52 per cent and the cane sugar 3.90 per cent, while the invert sugar of the sterilized must was 8.35 per cent and the cane sugar 2.24 per cent. It is thus seen that the sterilized must underwent a considerable decrease in cane sugar during storage and an increase in invert sugar.

Orchard studies, IX, X, XI, XII, W. B. Alwood (*Virginia Sta. Buls. 136, pp. 71–96; 137, pp. 99–135, figs. 14; 138, pp. 139–172, figs. 12; 139, pp. 176–184*).—Part IX treats of An investigation into the character of cider apples in Europe and comparisons with American fruit; Part X, A consideration of the commercial handling of cider fruit—grinding and expressing the must; Part XI, A consideration of the principles and technique involved in the fermentation and final finishing of ciders; and Part XII, The chemical composition of ciders. The material contained in these bulletins has already appeared in Bulletin 71 of the Bureau of Chemistry of this Department (E. S. R., 14, p. 1026).

Modern cider manufacture, or the art of making good cider, G. Jacquemin and H. Alliot (*La cidrerie moderne, ou l'art de faire le bon cidre. Malzéville-Nancy: Edg. Thomas, 1902, pp. VII+712, figs. 140, dgm. 1*).—This work is an exhaustive

treatise on the culture of apples and pears and the manufacture of cider and perry from them. Statistics are given on the production of cider, and notes on the history of cider making. About one-third of the book is taken up with a discussion of the propagation and culture of apples and pears and of the insects and diseases affecting them.

The remainder of the work, which deals with cider and perry, contains chapters on washing fruit, extraction of the juices, fermentation and the use of pure yeast cultures, sulphuring, clarification, and bottling of the manufactured products, the utilization of species of sorbus apples in cider making, pasteurization of cider, the diseases and defects of ciders, and the methods of handling such products. Chapters are also given on the manufacture of distilled spirits from cider, the production of vinegar, the preservation of apples and pears by drying, and the utilization of the pomace of these fruits.

Strawberry culture, P. Evans and F. W. Faurot (*Missouri State Fruit Exp. Sta. Bul. 7, pp. 14, pls. 9*).—This is a popular bulletin containing directions for the planting, selection, and cultivation of strawberries. The opinions of a number of growers representing 16 counties in the Ozark region on the best varieties for home and commercial use are tabulated. Sixty-nine per cent of the number replying recommend planting the medium and late varieties, and 31 per cent recommend early varieties.

Crawford's July report on strawberries, M. Crawford et al. (*Jour. Columbus Hort. Soc., 18 (1903), No. 3, pp. 103–109*).—Notes are given on a test of 55 varieties of strawberries.

Paraguay tea (Yerba mate), F. W. Neger and L. Vanino (*Der Paraguay-Thee (Yerba mate). Stuttgart: Fr. Grub, 1903, pp. 56, figs. 21*).—A botanical account is given of the various species of Ilex and other plants from which the tea yerba mate is produced in Paraguay. A chemical account is given of Paraguay teas and of the preparation and culture of mate and of its value from a commercial standpoint. A bibliography of the subject, including papers written by 29 different authors, is included.

Tea, W. B. Marshall (*Amer. Jour. Pharm., 75 (1903), No. 2, pp. 79–94*).—A descriptive article summarizing information on the botany and culture of tea, its preparation for the market, and related topics.

The propagation of tropical fruit trees and other plants, G. W. Oliver (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 46, pp. 26, pls. 8*).—Detailed directions are given for the propagation of mangoes, loquats, figs, tea, and Manila hemp. It is stated that the mango grows to perfection over a large tract of land in southern Florida. Tests of various methods of propagating this plant at the Department indicate that the most satisfactory unions have been secured when bud wood taken from branches from 1 to 6 years old has been used. As stocks, 2 to 3 year old seedlings and moderate-sized trees are best. Stems at least an inch in thickness are desirable.

Budding was most successful when a rectangular piece of bark, having a bud in the center, was fitted into a section of the stock corresponding in shape and just a little smaller. After fitting the bud patch in the bark a small quantity of grafting wax should be smeared around the edges and then tied firmly in place with thick strands of raffia. The inserted buds should then be shaded from the sun. Another method is described, in which one end of the bud patch is pointed.

Directions are given for raising seedling stocks, transplanting young seedlings, and importing mango scions. A batch of mango scions was successfully forwarded to the Department from Ceylon by covering the ends of the scions with collodion, dipping the bud sticks in clay mud, and then packing in a small amount of moist coir and shipping in cylindrical tin tubes.

The common shield method of budding has been found most successful with the loquat. With the fig a very successful method of propagation has been to prepare the stock as in shield budding and then insert a small twig having 1 terminal and 2

lateral buds. The scions should be selected, when possible, from branches not ove $\frac{1}{2}$ in. in diameter.

The experiments in propagating tea at Summerville, S. C., have shown that vari ties do not come true to seed, and hence some method of vegetative propagation desirable. It is stated that the quickest and least troublesome method of propagatio is by cuttings of the newly-ripened shoots. These cuttings should be taken fro moderate-sized branches of the current season's growth of wood and cut into length of from 4 to 5 in. At least 2 leaves should be left on each cutting. Methods veneer grafting and herbaceous grafting of tea are also described.

Seedlings of Manila hemp were successfully shipped to the Department from th Philippines by gathering the seed as soon as ripe, mixing with finely powdere charcoal, and shipping in small cylindrical tin tubes. Upon arrival at the Depar ment the seeds were sown in garden flats filled to within an inch of the surface wit clean, large-grained river sand, into which the seeds were firmly pressed and the covered with $\frac{1}{2}$ in. of sand. A sheet of glass was then placed over the box and th sand kept at a night temperature of about 75°, and a day temperature of 80° F. required about 14 days for the seed to germinate.

The publication is accompanied by several plates which illustrate the differen methods of propagation described in the text.

The Smyrna fig at home and abroad, G. C. ROEDING (*Fresno, Cal.: Autho 1903, pp. 87, pl. 1, figs. 45*).—Part I of this work discusses comprehensively the cu ture of the Smyrna fig in its native home, giving details as to methods of harvesting drying, packing, labor conditions, etc., and the extent of the industry abroad. Pa II gives the history of the development of the Smyrna-fig industry in California, wit an account of the introduction of the wild, or Capri fig, and of the fig wasp (*Blast phaga grossorum*).

The cocoanut with reference to its products and cultivation in the Phili pines, W. S. LYON (*Philippine Bureau Agr. Bul. 8, pp. 34, pls. 2, figs. 3*).—This is popular bulletin dealing with the history, botany, uses, cultivation, harvesting, an enemies of the cocoanut in the Philippines. It is believed that under proper cond tions the cocoanut is one of the most profitable crops that can be grown in th Philippines.

The manuring of cacao, A. COUTURIER (*Jour. Agr. Trop., 3 (1903), No. 27, p 259–262*).—Analyses are given showing the composition of good cacao soils, and su gestions made for the rational fertilizing of cacao.

Elements of prairie horticulture, N. E. HANSEN (*South Dakota Sta. Bul. 8 pp. 67–110*).—This account contains suggestions based on work at the station for th culture of orchard and small fruits, vegetables, wind-breaks, and ornamental shru and flowers. The State is divided into 12 districts, and varieties of fruits which it thought will succeed best in each district are indicated.

No apple less hardy than the Duchess should be planted in the northern half the State. To prevent root killing in winter a mulch of stable manure spread sever feet out beyond the branches of the trees is recommended. If the fall is dry heav soaking of the soil with water before the mulch is put on is believed to be of grea service.

Varieties of the hardy northern native plums are the only sorts that can be succes fully grown, and the only reliable stock is *Prunus americana*. In other words, th only plums recommended for South Dakota planters are the native wild ones. Sug gestions are given on growing plums from seed. The author finds it advisable graft 2-year-old trees before the buds start in the spring, by inserting the graft in side cut 2 or 3 inches below the soil surface, using a wedge-shaped scion. The eart is replaced and no grafting wax used except to cover over the top of the scion to pr vent drying out.

The culture of cherries is precarious. The Early Richmond has been successfully grown in a few southern counties, otherwise the general experience with this fruit is unfavorable. It is believed a waste of time to attempt to grow quinces, apricots, peaches, or pears in the State. Russian apricots are hardy, but the blossoms are killed by late frosts. Some sorts of Russian pears are also perfectly hardy, but are killed by blight. Raspberries, blackberries and dewberries have failed to make satisfactory growth at the station. Currants and gooseberries, however, are easily raised and have proved perfectly hardy without winter protection. Red Dutch, Victoria, and White Grape are the best varieties of currants, and Houghton the best gooseberry. Strawberries can be successfully grown. No grapes other than the native wild sorts have thus far been successfully grown.

Extensive experiments in the breeding of native northwestern fruits at the station are under way. It is believed that the native Juneberry, sand cherry, buffalo berry, gooseberry, cherries, plums, grapes, currants, strawberries, raspberries, etc., can be bred up equal in size and quality to the cultivated varieties. Over 100,000 fruit seedlings of these different sorts are now being tested on the station grounds. Special attention is being given to the improvement of the native sand cherry (*Prunus besseyi*). Some 75 varieties have already been selected as being worthy of propagation.

Crosses of 225 varieties of strawberries have been made with the wild strawberry. In this connection the author notes that the ever-bearing strawberries imported from France winterkilled, but that the hybrids of this sort with Dakota wild strawberries proved hardy. Settlers in South Dakota are urged to plant and cultivate the native fruits before investing heavily in the tender varieties common in nurseries. Many suggestions are given on methods of work in improving the wild fruits.

Wind-breaks are considered very essential, and the native plants, such as ash, elm, boxelder, and hackberry, are commended for this purpose. Imported trees, such as white willow, Russian golden willow, and for large thorny shelter belts, the Russian wild olive, are also noted as valuable. Planters are cautioned against securing trees from States farther south, since these are nearly certain to winterkill when planted in South Dakota.

Special care is necessary in setting out evergreens on the lawn. Trees not more than a foot in height are recommended. Larger evergreens may be successfully transplanted in late winter with a frozen ball of earth attached to the roots. In general spring planting for all trees is recommended. Evergreens most likely to succeed are the Black Hills or Ponderosa pine, the red cedar of northern regions, and the Jack pine from northwestern Minnesota. Where several rows of evergreens are set the rows should be at least 16 to 20 ft. apart. The poplars, especially cottonwood and Certinensis, are considered particularly desirable pioneer trees for use until better sorts can be established. Suggestions are given on the care of street and lawn trees, and in planting on hardpan.

Of several varieties of tomatoes tested Earliest of All, Early Ruby, Early Bird, and Early Leader are considered desirable sorts. Peppers and eggplants can be successfully grown when the plants are started under glass. Directions are given for making a cold frame and for planting a number of different sorts of vegetables.

Trees and shrubs for English gardens, E. T. Cook (*London: George Newnes, Ltd., 1902, pp. 471, pls. 129*).—In this work the author brings out specially the beauty in trees and shrubs and their usefulness in landscape gardening. Directions are given for the propagation and pruning of the various ornamental trees and shrubs commonly grown in Great Britain, and of planting and caring for them.

The etherization of plants, T. Jannock (*Gard. Chron., 3. ser., 34 (1903), No. 875, p. 240*).—The author reports that he etherized lilacs August 24. By September 18 the etherized plants were in full bloom and foliage. Lilac blooms from etherized plants were finer and lasted longer than those from retarded plants.

The best hardy perennials for cut flowers, F. W. Meyer (*Liverpool: Blake & Mackenzie, 1901, pp. 104, col. pls. 48*).—Descriptions illustrated by colored plates together with cultural directions are given for a large number of the more popular hardy perennials used for cut flowers in Great Britain.

Commercial violet culture: A treatise on the growing and marketing of violets for profit, B. T. Galloway (*New York: A. T. De La Mare Ptg. and Pub. Co., Ltd., 1903, 2. ed. rev., pp. 239, figs. 67*).—The first edition of this treatise, previously noted (E. S. R., 11, p. 852), has been slightly revised to conform to the changes in the methods of growing violets for the market that have occurred during the past 4 years.

Sweet violets and pansies (*New York: Chas. Scribner's Sons, 1903, pp. 100, pls. 13, figs. 5*).—Practical information is contained in this book on the culture of pansies, sweet violets, and wild violets. It has been written by several authorities and edited by E. T. Cook.

Soil-carrying machine, C. H. Roney (*Amer. Florist, 21 (1903), No. 801, pp. 392, 393, figs. 5*).—A description is given of a machine used in carrying soil into greenhouses. The machine is believed to be a decided advantage over wheelbarrows or any other contrivance used by florists for this purpose.

Directory of florists, nurserymen, and seedsmen of the United States and Canada (*Chicago: Amer. Florist Co., 1903, pp. 414*).—In this directory the addresses are given of the florists, nurserymen, seedsmen, gardeners, horticulturists, landscape architects, parks, cemeteries, botanical gardens, societies, and horticultural supply concerns of the United States and Canada. The matter is arranged both by States and post-offices, and all names alphabetically. Considerable statistical matter has been incorporated from the United States Census of 1900.

FORESTRY.

Principles of American forestry, S. B. Green (*New York: John Wiley & Sons, 1903, pp. XIV+334, figs. 73*).—This is a book on elementary forestry which has been prepared especially for students and other beginners of the subject, as well as for the general reader who wishes to secure a general idea of forestry in North America. Much of the matter included was originally published by the author under the title Forestry in Minnesota (E. S. R., 14, p. 361), the material being largely rewritten for the present volume so as to be more general in character and better adapted to the whole country.

Our northern shrubs, Harriet L. Keeler (*New York: Charles Scribner's Sons, 1903, pp. XXX+521, figs. 240*).—This is a handbook of the shrubs indigenous and introduced in the region extending from the Atlantic Ocean to the Mississippi Valley, and from Canada to South Carolina, Georgia, and westward. The arrangement of the shrubs is by families, each representative being scientifically and popularly described; and keys are furnished whereby almost every shrub found in the region embraced may be identified and its habits learned.

The book is designed not only for the amateur who desires a more complete description of our shrubs than that usually given in text-books, but gives valuable information for the utilization of shrubs in the establishment and decoration of parks, roadways, school yards, railway stations, and home grounds.

With the trees, Maud Going (*New York: Baker & Taylor Co., 1903, pp. X+[illegible], figs. 40*).—A popular book designed to awaken an interest in trees and their surroundings. The author defines and describes the different plant organs and describes their functions, after which different tree associations are discussed. In addition to popularizing scientific truths regarding trees, the author has introduced considerable folklore and legendary fancies regarding them, the whole being woven together in a very attractive manner.

Forestry for the farm, J. Gifford (*Connecticut State Bd. Agr. Rpt. 1902, pp. 85–95, pls. 5*).—It is claimed that on nearly every farm there are some areas which by reason of soil conditions are better fitted for growing a wood lot than for general farming. If properly cared for these places may be made profitable by planting with suitable species of forest trees. In choosing species for planting adaptability to soil and climate, rapidity of growth, ease of propagation, freedom from disease, and utility must be considered. Directions are given for collecting forest-tree seed, their propagation in the nursery, and methods of planting. The value of the forest nursery is pointed out and suggestions given for propagating forest seedlings, as well as for planting the seed where the trees are to stand.

The economic value of forests, E. Bruncken (*Forestry and Irrig., 9 (1903), No. 7, pp. 353, 354*).—Attention is called to the fact that American and English writers on economics have paid but little attention to the economic consideration of forests and forest products. This is attributed to a lack of information on the peculiar position of the forest as an economic factor. The forest yields its crop at intervals of 50 to 150 years and consequently is often disregarded. The author thinks this subject an important field for investigation by intelligent economists and foresters.

Should the forests be preserved? (*San Francisco: California Water and Forest Assoc., 1903, pp. 48, figs. 10*).—This is a pamphlet which has been prepared by the Water and Forest Association as an answer to objections that have been raised regarding the establishment of new forest reserves and the enlargement of the old reserves in California. It is stated that the preservation of the forests is essential to the permanence of agriculture, and the fruit-growing and lumbering interests of the State, and that the establishment of reservations will tend to conserve these interests as far as possible.

Restoration of forests, O. H. Baker (*Tradesman, 50 (1903), No. 2, p. 81*).—On account of the rapid destruction of the forests in the United States, the author calls attention to the qualities of various Australian species which are believed to be adapted to cultivation on the denuded lands, especially on hilly and rocky ground unfit for general farming. The trees described are mostly species of Eucalyptus, many of which have been successfully grown in California and in other regions with a similar climate.

Making the wood lot more profitable, W. Mulford (*Connecticut State Bd. Agr. Rpt. 1902, pp. 71–84, pls. 5*).—In a popular lecture the author points out some of the sources of loss and results of mismanagement, and endeavors to show how this may be avoided and the farm wood lot made a source of permanent income.

A working plan for forest lands in Hampton and Beaufort Counties, South Carolina, T. H. Sherrard (*U. S. Dept. Agr., Bureau of Forestry Bul. 43, pp. 54, pls. 13, dgms. 11*).—The working plan here presented is a result of investigations made by the Bureau of Forestry on a tract of land owned by the Okeetee Gun Club in Beaufort and Hampton Counties, S. C., about 30 miles northeast of Savannah.

This tract comprises an area of about 60,000 acres and embraces low, flat sand plains bordered by broad swamps along the streams and brooks. Most of the timber has been culled and in some places agriculture has been practiced, but some of the areas have been abandoned and are now growing up to young forests. The original forest comprised dry sand lands and swamp forests, the latter remaining practically intact. Upon drier situations the forest was originally almost a pure forest of longleaf pine, while in places was a mixture of loblolly, Cuban, and pond pines. The swamps support a varied growth, the most characteristic trees of which are cypress and gums. The different forest types are described at considerable length and estimates given of the present stand of a number of measured areas.

The object of the working plan is to reforest the area and manage it as a forest without interfering in any way with the tract as a game preserve. Suggestions are

given for carrying out these plans, and statements regarding the future yield, market, occupation, etc., and directions for the lumbering of the tract are also given.

The diminished flow of the Rock River in Wisconsin and Illinois, and its relation to the surrounding forests, G. F. SCHWARZ (*U. S. Dept. Agr., Bureau of Forestry Bul. 44, pp. 27, pls. 6*).—The purpose of the investigation here reported was to ascertain the principal factors upon which the flow of the Rock River depends, and to discover, if possible, practical means for increasing the flow or equalizing the volume of the river. In the region drained by this river the forests have been greatly reduced in area and the condition of those still remaining is far from satisfactory. Since 1885 there appears to have been a decrease in the rainfall, and this has aided materially in diminishing the volume of the river flow. The improvement of the conditions depends on the storing of water, accomplished by the construction of artificial reservoirs, or by equalizing its flow through the agency of forest growth.

The present condition of the wood lots in the region is such that the wooded area might be extended with decided profit to the farm. This could be done without expert assistance or any considerable outlay of capital or other expenditure aside from protection of wooded areas from fires and the care and management of the present areas, together with the planting of additional ones. Detailed descriptions are given, showing some of the deficiencies of the wood lots and how they may be improved.

Injuries to shade trees from electricity, G. E. STONE (*Massachusetts Sta. Bul. 91, pp. 21, figs. 12*).—On account of the increased interest regarding shade trees and roadside improvement and the adverse conditions which trees grown in these situations have to contend with, the author has investigated a number of the problems and in the present bulletin shows the effect of electrical injury to shade trees.

A considerable amount of damage is found to be due to wires in causing abrasions, destruction of limbs, burning, etc., which necessitates much injudicious pruning. The greatest amount of damage is the local burnings caused by the electrical current, and the higher the electro-motive force the more injury is likely to occur to the trees. There appears to be little or no leakage from wires during dry weather, but in wet weather when a film of water is formed on the bark there is considerable transfer of electric current. No authentic cases, so far as the author could ascertain, have been observed where the alternating current, such as is used for electric lighting, has killed trees, although cases are recorded where the direct current used in operating street railways has destroyed large shade trees. This has been accomplished by reversing the polarity, causing the positive current to traverse the rail and the return current the feed wire, which usually carries the positive current.

In general, trees possess such high resistance to electric current as to serve as a protection against their destruction. Different portions of the trees were tested and it was found that the least resistance occurs in the cambium layer and those tissues adjacent to it. Electric currents of a certain intensity when applied to plants act as a stimulus, the alternating current acting more as a stimulus than the direct current. There seems to be some evidence that even though the current is not of sufficient strength to cause burning, it may overstimulate the plant, causing a retardation of its activities, which subsequently results in its death.

Investigations carried on in connection with these experiments show that the earth discharges during thunderstorms are more common than are generally supposed, and are known to disfigure and cause the death of many trees.

The honey locust in western Kansas, R. S. KELLOGG (*Forestry and Irrig., 8 (1902), No. 8, pp. 387-390, figs. 3*).—A description is given of the honey locust (*Gleditschia triacanthos*), which grows naturally in the valleys of eastern Kansas and has proved to be one of the hardiest trees for planting on the uplands of the western part of the State, where the annual rainfall is 20 in. or less. It has demonstrated its ability to withstand adverse conditions of soil and climate, being exceeded in this

respect only by the red cedar. The principal uses to which the honey locust plantation can be put are hedges, shelter belts, and ornamental plantations, the wood being of comparatively little value. The honey locust is easily propagated, and for extensive plantings sowing the seed in rows early in the spring and transplanting to permanent situations is recommended.

The culture and uses of the species of Eucalyptus (*West Indian Bul., 4 (1903), No. 2, pp. 145–175*).—This article contains an extended compilation from the Bureau of Forestry Bulletin 35 (E. S. R., 14, p. 575), together with notes on the distribution and growth of a number of species of Eucalyptus in Jamaica, Trinidad, St. Vincent, Barbados, Dominica, and other parts of the British West Indies, and a list of the species which are believed to be suitable for tropical conditions in that region.

The redwood (*Forestry and Irrig., 9 (1903), No. 6, pp. 300–305, figs. 5*).—In this article a description is given of one of California's most valuable timber trees, the data being largely compiled from Bureau of Forestry Bulletin 38 (E. S. R., 14, p. 971).

The Unalaska spruce plantation, B. ADAMS (*Forestry and Irrig., 9 (1903), No. 8, pp. 382–385, figs. 4*).—An account is given of an attempt made to establish a spruce plantation near Unalaska. The trees were planted nearly a century ago and have made only a very small amount of growth, and that only in sheltered portions of the island. From the results of this limited plantation the author believes that this part of Alaska is not adapted to timber growing.

Bamboos in the United States, L. HARRISON (*Forestry and Irrig., 9 (1903), No. 8, pp. 400–404, figs. 5*).—An account is given of some of the cultural possibilities of bamboos, most of the information being drawn from Bureau of Plant Industry Bulletin 43 (E. S. R., 15, p. 249).

Wood preservation, P. DUMESNY (*Conservation des bois. Paris: Bernard Tignol, 1902, pp. 35, figs. 3*).—The author briefly describes some of the methods that are in use for preserving timber against decay, rendering wood fireproof, etc. Considerable attention is given to the effect of electricity in seasoning timber and as an aid to the infiltration of timber with chemicals.

Foreign trade of the United States in forest products, 1902, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 33, pp. 72*).—During the fiscal year 1902 there was imported into the United States $59,000,000 worth of forest products and $49,000,000 worth was exported. A summary is given of the imports and exports, the principal imports being gums of various kinds, lumber, cabinet woods, dyewoods, wood pulp, and cork. The exports consist very largely of lumber and timber, the combined shipment amounting to $36,000,000. In addition considerable quantities of naval stores, wood pulp, tan bark, and charcoal are exported.

SEEDS—WEEDS.

The effect of light on seed germination, E. HEINRICHER (*Bot. Centbl., Beihefte, 13 (1902), p. 164; abs. in Bot. Centbl., 92 (1903), No. 10, p. 204*).—The investigations of the author show that light exerts a strong influence on the germination of seeds. In some cases, as in Mesembrianthemum, Portulaca, and *Stapelia variegata*, the seed germinates equally as well in light or darkness. In some other cases the seed will sprout only in the dark, and seed of *Pitcairnia maidifolia* and *Drosera capensis* will germinate only in the light, those of the latter losing their germinative ability if kept in darkness. The seed of many cacti are hastened in their germination by the action of light. The effect of light upon the germination of seed of all the members of a plant family can only be determined by repeated trials, since nearly related species behave differently.

Observations on the duration of the vitality of seed, J. POISSON (*Bul. Soc. Bot. France, 50 (1903), No. 5–6, pp. 337–354*).—A review is given of considerable literature relating to the prolonged vitality of various species of seeds, and the author

briefly describes his own experiments, summarizing the results. The author claims that the prolonged vitality of many seeds depends upon the temperature in which they are stored, the dryness of the atmosphere, and the action of oxygen and of light. He claims that light exerts a positive effect on seeds aside from that of influencing them through a rise in temperature.

Report of the Seed Control Station of Christiania, 1902, O. Qvam (*Ber. Stat. Kem. Kontrolstat. og Frökontrolanst. Kristiania, 1902, pp. 35–54*).—A report is given of the seed control investigations conducted during the year 1902. During this period 1,287 samples of seed were tested, of which 573 were cereals, 279 grass seed, 346 leguminous forage plants, and the remainder seed of garden plants, forest trees, etc. The form of contract and guaranty are given, together with data regarding the fees for seed testing. The maximum, minimum, and average germinations of all the species of seed tested are shown in tabular form.

Some weeds of Iowa, L. H. Pammel (*Iowa Sta. Bul. 70, popular ed., pp. 295–372, figs. 63*).—This is a condensed and popularized edition of a more extended bulletin to be published relating to the weeds of Iowa, and is to take the place of previous publications of the station relating to weed problems. After describing the duration of weeds and giving general observations upon their eradication, the author describes at considerable length various weed pests, grouping them under the headings of weeds of corn fields, grain fields, clover fields, timothy meadows, pastures, garden crops, and poisonous weeds.

Hawkweeds, W. M. Munson (*Maine Sta. Bul. 95, pp. 114–116*).—The author comments upon the wide distribution of the orange hawkweed (*Hieracium aurantiacum*) throughout the State, stating that it has become one of the worst weeds destroying all grass in its vicinity and being of itself of no value for hay. Numerous attempts have been made to destroy this weed by the application of salt, kerosene, or other chemicals but the experience at the station shows that the only certain remedy for its eradication is clean culture with some hoed crop.

Notes are also given on the king-devil weed (*H. prealtum*), which is sometimes associated with the orange hawkweed and has proved in some regions more troublesome even that pest. It may be distinguished from the orange hawkweed by producing stems 2 or more feet high and several from the same root. For its eradication the same plan recommended for the orange hawkweed should be adopted, and the treatment should begin early in the year and continue throughout the growing season.

The chemical extermination of weeds, J. O. Morgan (*Agr. Education, 6 (1903), No. 1, pp. 10–12*).—The results of a number of experiments with different chemicals for the destruction of weeds are given. Weed plats of one-fourth rod each were selected and received applications of solutions of copper sulphate, corrosive sublimate, potassium sulphid, common salt, and sodium arsenate. The weeds embraced a large number of species of different genera of plants and as would have been expected the effect on the different forms varied widely.

The potassium sulphid appeared to have no effect whatever in checking the weed growth, and the copper and corrosive sublimate solutions were without very much effect in deterring them. The best results were obtained where sodium arsenate was used, and where considerable areas are to be treated it is suggested that spraying with this solution would give the best and cheapest results.

Noxious weed inspection, T. N. Willing (*Rpt. Dept. Agr. Northwest Territories, 1902, pp. 30–33*).—A review is given of the condition reported by the weed inspectors in the Northwest Territories, and the author calls attention to the fact that competent inspectors can not be retained and do good work at the present rate of compensation. The advantage of weed inspection is pointed out and some progress is being made in securing the compliance with the laws relating to weed destruction. Attention is called to the danger of the distribution of noxious weeds through the sowing of flaxseed, and to extensive farming is attributed the distribution of many of the worst weeds in the country.

Elevator inspection, which is included as part of the duties of the inspector of noxious weeds, is briefly reported upon. In the main it was found that the elevators throughout the Northwest Territories are careful in cleaning and distributing their seed. Some instances were found in which large amounts of noxious weed seed were present in the screenings from wheat and oats.

DISEASES OF PLANTS.

Immunity to plant diseases secured by the absorption of fungicides, E. MARCHAL (*Ing. Agr. Gembloux, 13 (1903), No. 12, pp. 524–527*).—On account of the apparent success which certain investigators had reported on securing the immunity of potatoes to the downy mildew, the author investigated the possibility of securing immunity to lettuce and various cereals against some of their more destructive parasites.

In the lettuce experiments young seedlings were removed to culture media containing from 6 to 8 parts of copper sulphate in 10,000, and after growing in this for some time were inoculated with spores of *Bremia lactucæ*. The plants seemed to show considerable resistance and the immunity seemed to be in proportion to the strength of the solution. Where grown in solutions containing 1 part in 10,000 or less of the fungicide no predisposition to immunity was shown.

The experiments with cereals were for the protection against rusts and mildew. In these experiments no immunity was secured. The author believes that immunity against such fungi as the downy mildews may to some extent be secured by the absorption of fungicides by the growing plant.

Parasitic fungi, G. P. CLINTON (*Connecticut State Bd. Agr. Rpt. 1902, pp. 253–265*).—In an address the author popularly describes parasitic fungi and their methods of attacking numerous economic plants. Suggestions are given for the control of parasitic fungi, selection, pruning, and treatment for fungicides being described. In conclusion, the author briefly describes bacteria, rusts, smuts, downy mildew, and powdery mildew as causes of plant diseases.

Pathological plant anatomy, E. KÜSTER (*Pathologische Pflanzenanatomie. Jena: Gustav Fischer, 1903, pp. VII+312, figs. 121*).—This is an outline study of the anatomy of pathological plant tissues in which the author treats of the modified structures produced by various factors that induce departures from normal. It is an outgrowth of a previous publication by the author on the anatomy of plant galls.

A study of some diseases of cereals in Mexico, S. BONANSEA (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 18 (1903), No. 3, pp. 125–136*).—A list is given of the various cryptogamic parasites of cultivated cereals in Mexico. This includes various smuts, rusts, etc., and suggestions are given for their prevention so far as any means are known.

A cotton disease at Montserrat, H. H. BALLOU (*Agr. News [Barbados], 2 (1903), No. 38, p. 309*).—A brief description is given of a disease of cotton caused by a leaf-gall mite, *Phytoptus* sp. This pest has destroyed a considerable amount of cotton and so far as the author has been able to determine it has not previously been reported upon this plant. He states that all ratoon cotton should be destroyed and active measures taken for the destruction of the mite, as it threatens to become one of the most serious pests of the cotton plant.

Experiments in the prevention of oat smut, T. JOHNSON (*Econ. Proc. Roy. Dublin Soc., 1 (1902), pp. 119–131; abs. in Bot. Centbl., 92 (1903), No. 20, p. 465*).—A report is given of tests of formalin, hot water, sodium sulphid, and potassium sulphid for the prevention of oat smut in Ireland. Based upon the results obtained, the author recommends soaking the seed before sowing in solutions of potassium sulphid or sodium sulphid for simplicity of procedure and efficiency of treatment.

Investigations on the black shank of potatoes, O. APPEL (*Arb. K. Gesundheitsamte, Biol. Abt., 3 (1903), No. 4, pp. 364–432, pl. 1, figs. 15*).—The author gives a description of a bacterial disease of potatoes due to a hitherto undescribed species, *Bacillus phytophthorus*. This organism causes what is known as black shank of the stems and the rotting of the tubers. The attack on the stems is most apparent near the ground. The stems are blackened and become rotten; hence the name black shank or stem rot. Later the tubers are affected, being rendered useless by the rot.

The organism, which is fully described, is said to be quite distinct from *B. solanacearum*, widely known in this country. Numerous infection experiments in the laboratory and field have been made which show the infectious nature of the disease. Inquiries were instituted on the distribution of this disease, and from the replies received it was found to be quite generally distributed throughout Germany. Marked differences in the susceptibility of varieties of potatoes are noted, and experiments are reported which were carried on to test the ability of the organism to live on other host plants than potatoes. The bacteria were found capable of infecting horse beans, lupines, carrots, certain varieties of turnips, cucumbers, etc.

Soaking the seed tubers in Bordeaux mixture was found to reduce the amount of disease considerably but not entirely. As practical suggestions for combating this disease the author suggests a rotation of crops in which neither potatoes nor any of the above-mentioned crops should occupy the ground for a number of years, the planting of whole potatoes, disinfecting them with fungicides, and the avoiding of strong nitrogen fertilizers, especially Chili saltpeter and ammonium sulphate.

The infection of sugar beets by Rhizoctonia violacea, F. BUBAK (*Ztschr. Zuckerind. Böhmen, 1903, No. 8, pp. 5; abs. in Bot. Centbl., 93 (1903), No. 34, p. 193*).—During 1901 and 1902, sugar beets in Central Bohemia were attacked by the root-rot fungus *Rhizoctonia violacea*. In one locality, at least 15 per cent of the beets was destroyed by the disease. It was not definitely determined whether the infection was through the soil or introduced through spores upon the seed when planted. The author recommends for the prevention of the disease treating the soil with quick lime, better attention to drainage, and a rotation of crops so that beets will not be cultivated more than once in 4 years.

The rind disease of sugar cane in the West Indies, A. HOWARD (*Internat. Sugar Jour., 5 (1903), No. 53, pp. 215–225, pl. 1*).—The results of several years' study of the diseases of sugar cane are given, particular attention being devoted to the so-called rind disease. This disease in the West Indies is said to be identical with the red smut disease of Java, and is caused by the fungus *Colletotrichum falcatum*. This fungus is able to infect ripening canes at wounds and old leaf bases, and can attack the young canes in any of the rapidly growing tissues. The Melanconium found on diseased sugar canes in the West Indies is a saprophyte and is not to be considered as a cause of the rind disease, but readily attacks plants which have been weakened by the Colletotrichum. Experiments have shown that the destructiveness of this disease may be reduced by burning the diseased canes at time of harvest, stripping the growing canes, planting from the best cuttings, and controlling the cane-boring insects.

The Sereh disease in the West Indies, F. A. F. C. WENT (*Indische Mercuur, 25 (1903), Herinneringsnummer, p. 19; abs. in Bot. Centbl., 93 (1903), No. 29, p. 66*).—The author reports the presence of the Sereh disease in the cane fields of the West Indies and northern South America. From the leaf sheath of stalks has been taken the Verticillium form of *Hypocrea sacchari*, which seems to substantiate the author's hypothetical relationship between the Sereh disease and this fungus.

A bacterial disease of tobacco, G. DELACROIX (*Jour. Agr. Prat., n. ser., 6 (1903), No. 38, pp. 385, 386*).—A preliminary account is given of the bacterial disease of tobacco which has been observed in a number of regions in central France. The first appearance of the disease was noted in July when the plants had attained a

height of from 0.2 to 0.3 meter. At this time the stems and the principal veins of the leaves were observed to be more or less covered with oblong spots in which the tissue was discolored and depressed. As the disease progressed the stems and veins became covered with spots, the central portion of which became dry and white. The diseased stems lost their rigidity and the leaves became wilted.

The names canker, anthracnose, smut, etc., have been given this disease, which, according to the investigations of the author, is caused by attacks of a species of bacteria to which the name *Bacillus æruginosus* has been given. The disease is to be studied further and the cause and possible means of prevention will be fully described later.

On the occurrence of the wilt disease of sesame, A. von Jaczewski (*Ann. Mycol., 1 (1903), No. 1, pp. 31, 32; abs. in Bot. Centbl., 92 (1903), No. 23, p. 543*).—The author reports the presence of the fungus *Neocosmospora vasinfecta* on the cultivated sesame. An examination of diseased plants showed the stems infested with a mycelium, which was readily isolated and studied. From the characters observed, the author is led to believe that it is due to the above-named fungus. If the fungus should prove identical with that causing the wilt of cotton, cowpeas, melons, etc., another host plant is added to the list of species subject to its attack.

Tomato wilt, A. Despeissis (*Jour. Dept. Agr. West Australia, 7 (1903), No. 2, p. 103*).—A brief description is given of the bacterial blight of tomatoes, which has been recently ascribed to attacks of *Bacillus solanincola.* For the prevention of this disease it is recommended that spraying with Paris green in order to destroy the leaf-eating insects should be thoroughly practiced, and attention given to all other related plants which may be attacked by this same organism.

A disease of peas due to Fusarium vasinfectum, C. van Hall (*Ber. Deut. Bot. Gesell., 21 (1903), No. 1, pp. 2–6; abs. in Bot. Centbl., 92 (1903), No. 16, pp. 363, 364*).—A disease of peas due to attacks of a fungus, *Fusarium vasinfectum*, has been under observation in Holland for a number of years. The affected plants turn yellow and soon die, and an investigation shows that the roots are the seat of the fungus attack. The organism causing the disease has been isolated and studied on a number of media. It is believed to be closely related to the fungus which causes the wilt of melons, cotton, cowpeas, etc., and the author has described it as *F. vasinfectum pisi* n. var. Inoculation experiments have been successfully performed showing that this fungus is the cause of the disease. As it usually makes its appearance about June 24, the disease is locally known as St. John's disease of peas.

Two decays of stored apples, H. J. Eustace (*New York State Sta. Bul. 235, pp. 123–131, pls. 4*).—A description is given of an apple rot which was observed to follow the apple scab and a core decay of Baldwin apples. Subsequent to the publication of the station bulletin on the pink rot of apples (E. S. R., 14, p. 1088) specimens of diseased Rhode Island Greening apples were observed, which presented decayed areas somewhat similar in general appearance as that described as pink rot. A more critical examination, however, showed that the fungus causing the disease was entirely different.

In comparing the pink rot of apples and the decay caused by this new fungus, it was found that in the pink rot there is usually a conspicuous white or pinkish growth of the fungus in the center of the infected spot, while the new fungus does not show at all conspicuously on the surface of the decayed spot until forced to do so by artificial conditions. The pink rot of the fruit is a very shallow growing fungus, penetrating the tissues not more than one-eighth of an inch, while the new disease extends much deeper and in its later stages reaches to the core. The tissues decayed by the pink-rot fungus are very characteristic and decidedly bitter, while the tissue decayed by the other fungus is only slightly so. The fungus causing this new rot was determined as a species of Hypochnus, a description of which is given.

The amount of damage caused by this fungus to stored apples is probably not very large, but specimens of affected fruit have been observed from a number of localities. So far it has been found on Baldwins and Rhode Island Greenings only. Inoculation experiments have shown, however, that the organism would grow equally as well on other varieties as upon these two. The results of the inoculation experiments show that the fungus is a wound parasite, as the mycelium was unable to penetrate the unbroken epidermis of the fruit. The cracked epidermis, due to the apple scab, rendered the conditions advantageous for an attack of this fungus; and this new disease emphasizes the importance of protecting apples from scab by thorough and persistent spraying with Bordeaux mixture. Finding decayed apples in several cold storage houses indicated that low temperature alone can not be relied upon to hold this trouble in check, although it probably does retard its development to some extent.

The core decay of Baldwin apples described shows no outward manifestation, but upon being cut in two a part of the tissue surrounding the core was found to be decayed. This decayed tissue was brown, dry, and tasteless, and was entirely surrounded by healthy tissue of normal quality. Examination failed to show the presence of any fungus or other organism as the cause of the trouble. Other conditions, such as immaturity, effect of different fertilizers, different soils, overbearing, etc., have been examined, but so far the disease can not be attributed to any definite cause.

Two new apple rots, F. H. Hall and H. J. Eustace (*New York State Sta. Bul. 235, popular ed., pp. 4*).—A popular edition of the above-noted bulletin.

Spraying the plum orchard, W. B. Alwood and H. L. Price (*Virginia Sta. Bul. 134, pp. 31–40, figs. 5*).—The plum trees at the station are said to be subject to attacks of leaf diseases caused by *Cylindrosporium padi* and the brown rot (*Sclerotinia fructigena*), and experiments have been conducted for the prevention of these diseases. The details of the experiments are given. The treatment consisted ordinarily of a winter treatment of copper-sulphate solution followed by applications of a 4–5–50 solution of Bordeaux mixture. If thoroughly applied these methods are efficient in checking the disease.

For the control of the brown rot it is necessary to begin spraying quite early in the season, and for the leaf diseases late applications should be given if a healthy condition of the tree is to be maintained to the end of the growing period. For the prevention of the rot it is also desirable to collect and destroy all of the diseased fruit.

On the occurrence and treatment of fire blight in the pear orchard, W. B. Alwood (*Virginia Sta. Bul. 135, pp. 51–66, figs. 5*).—A report is given on investigations for the prevention of fire blight, due to *Micrococcus amylovorus*, in which spraying, pruning, fertilizing, etc., were tried. So far it has been found impossible to hold the disease in check by the cutting out of diseased tissues and spraying the plants, although it is still thought that this preliminary treatment should not be neglected. There seems to be some evidence that fertilizers will enable the trees to resist disease to a marked degree, but these tests must be continued before a definite opinion can be formed regarding their value. Different varieties seem to be affected unequally, and the author gives a list of varieties which in his experience are less subject to the disease than others.

A remedy for cranberry scald, C. L. Shear (*Amer. Agr., 72 (1903), No. 10, p. 309*).—According to the author's investigations, which have been carried on for the past 2 years, the cranberry scald infection takes place through the aerial portions of the plant, rather than by way of the roots, as has been formerly supposed. After having established this fact, the author experimented with fungicides for the control of the disease, testing potassium sulphid, ammoniacal solution of copper carbonate, and Bordeaux mixture.

The results obtained seem to indicate that a thorough application of properly prepared Bordeaux mixture will prove a practical remedy for the cranberry scald, and

it is probable that 4 or 5 applications should be made during the season, the last not earlier than August 15. As the foliage of the cranberry is very smooth and glossy, it has been found desirable to add to the ordinary formula for Bordeaux mixture 5 lbs. resin, 1 lb. potash, 1 pt. fish oil, and 5 gal. water.

A bacterial disease of grapes, A. Zschokke (*Weinbau u. Weinhandel, 20 (1902), No. 29, p. 308; abs. in Bot. Centbl., 93 (1903), No. 30, p. 89*).—The author reports observing upon grape stock small irregular dark-green or brownish spots, about 1 mm. in diameter. Later these became moist and slimy. An examination showed the presence of 2 species of bacteria, which were separated and characterized. From the appearance of the disease the author believes that this is not identical with the so-called brunissure, or California blight disease.

A new disease of mountain ash, A. von Jaczewski (*Ann. Mycol., 1 (1903), No. 1, pp. 29, 30; abs. in Bot. Centbl., 92 (1903), No. 23, p. 543*).—A report is given of the presence on the leaves of *Sorbus aucuparia*, of grayish-white round spots with concentric brown layers, which the author claims is due to a species of Leptosphæria, to which he has given the name *L. sorbi*.

Bacterial spot of carnations, A. F. Woods (*Science, n. ser., 18 (1903), No. 460, pp. 537, 538*).—A report is given of a new disease of carnations which has been under examination, specimens having been received from Pennsylvania and the District of Columbia. In the earlier stages the disease resembles stigmonose or insect puncture (E. S. R., 12, p. 460), but the small spots are usually surrounded by a narrow water-soaked area, while the center of the spot is usually light brown. As the spots grow larger they resemble the ordinary carnation spot. The spots increase in size more rapidly in soft-leaved varieties, which soon collapse and dry, leaving a brown sunken area.

Examination showed that in all stages the spots are filled with bacteria which have been isolated, cultivated on various media, and used in inoculation experiments, showing that the bacteria are the cause of the disease. They are quite different from the form described as the cause of bacteriosis of carnations (E. S. R., 8, p. 235). The bacteria seemed to gain entrance through punctures, injuries of any kind, or possibly through the stomata. When the disease has not progressed very far it may be checked by cleaning the plants of all diseased leaves and stems and spraying with a solution of 1 part formalin to 500 parts water. The disease is to be the subject of further investigation, which will be duly reported.

Sulphate of iron for chlorosis in trees and plants, H. M. Stringfellow (*Texas Farm and Ranch, 22 (1903), No. 38, p. 10*).—The author was successful in curing chlorosis of vines and fruit trees by the use of sulphate of iron dissolved in water and sprinkled about the roots. He believes that 5 to 10 lbs. would cure a large bearing tree.

ENTOMOLOGY.

Report of the entomologist, F. Sherman, Jr. (*Rpt. Comr. Agr. North Carolina, 1902, pp. 34–39*).—Brief notes are given on the methods best adapted for destroying the common injurious insects, together with a summary of the work of the entomologist for the past 2 years in the inspection of nurseries.

Injurious insects. Spraying for insects and diseases, F. Sherman, Jr. (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 6, pp. 39, figs. 21*).—Short descriptive, biological, and economic notes on harlequin cabbage bug, cabbage plusia, cabbage butterfly, white grubs, Hessian fly, tobacco flea-beetle, black grain weevil, corn billbug, bagworm, elm-leaf beetle, San José scale scurfy scale, oyster-shell bark-louse, woolly aphis, codling moth, peach-tree borer, blackberry-cane borer, and plum curculio. Formulas are also given for the preparation of approved insecticides and fungicides.

The insect problem, H. OSBORN (*Jour. Columbus Hort. Soc., 18 (1903), No. 2, pp. 40–43*).—Statistics are presented for the purpose of showing the extent of losses due to insect depredations in various parts of the country. The damage caused by codling moth, plum curculio, chinch bug, and Hessian fly is specially mentioned.

Some destructive insects, D. A. SAUNDERS (*South Dakota Sta. Bul. 81, pp. 63–66*).—Brief descriptive, biological, and economic notes on wheat aphis, elm coxcomb gall, vagabond gall louse, Hessian fly, and plum gouger.

The horticultural law of Utah, T. JUDD ET AL (*Utah State Bd. Hort. Bul. 8, pp. 16*).—A copy of the horticultural law of Utah passed in 1903 is given, together with rules, formulas, and recommendations promulgated by the State Board of Horticulture for the control of dangerous insect and fungus pests.

Entomological studies in Jylland in 1902, N. FRITZ (*Hedeselsk. Tidsskr., 1903, No. 8, pp. 188–192*).—Brief notes on *Tortrix pinicolana*, *T. nemorivaga*, *Grapholitha tadella*, etc.

Report on the injurious insects of Finland for 1902, E. REUTER (*Landtbr. Styr. Meddel. [Helsingfors], 1902, No. 45, pp. 22*).—The author's report for 1902 is occupied chiefly with a discussion of insects injurious to grass, cereals, potatoes, certain garden vegetables, fruit trees, and ornamental shrubs. Notes are given on the habits and injurious attacks of *Charæas graminis*. The author discusses at some length the conditions under which the so-called white-head condition of grasses appears and mentions a considerable variety of insects which are concerned in producing this disease. Mention is made of a bacterial disease of potatoes known by the name of black shank. *Athalia spinarum* is reported as injurious to turnips. Notes are also given on cabbage butterfly, codling moth, pear-tree psylla, apple aphis, *Cheimatobia brumata*, and *Anthonomus rubi*.

Insects injurious to fruit and garden crops in Russian Poland, I. K. TARNANI (*Nasyekomuiya vrednuiya dlya plodovodstva i ogorodnichestva v guberniyakh Tzarstva Polskago. Warsaw: Novo-Alexandri Inst. Selsk. Khoz. i Lyesov, 1903, pp. 138, figs. 136*).—The author presents a general account of the economic importance of insects, their anatomy, metamorphosis, food, enemies, and causes of excessive multiplication. Special chapters are devoted to beneficial insects, Orthoptera, Hemiptera, Coleoptera, Lepidoptera, Diptera, and Hymenoptera. Notes are given on the various artificial remedies for controlling injurious insects and on fungus diseases, parasitic and predacious insects, and birds which assist in controlling injurious species. Among the various injurious insects which are discussed mention may be made of the following: Mole cricket, earwig, apple aphis, cabbage aphis, cockchafers, pea weevil, apple weevil, fruit-tree bark-beetle, asparagus beetles, cabbage butterflies, gypsy moth, brown-tail moth, cutworms, codling moth, cabbage maggots, currant sawfly, etc. A list of garden vegetables is presented, showing the most important species of injurious insects attacking them.

Insect pests, A. LEHMANN (*Dept. Agr. Mysore State, Rpt. Agr. Chem., 1901–2, pp. 17–24*).—Brief notes on insects injurious to castor bean, date palm, coffee, rice, and mango. Coffee suffered greatly from the attacks of *Lecanium viride* and a species of mealy bug. The chief insect pest of rice was *Cecidomyia oryzæ*.

Insect notes (*Agr. News [Barbados], 2 (1903), No. 37, p. 298, figs. 2*).—Notes on the changa or mole cricket, which is reported to be quite injurious in the West Indies. The insect has been controlled to some extent by placing boards on edge in the soil around seed beds, and by the use of soap and water on lawns.

The common sunflower has been found to be a valuable trap plant in combating the attacks of the fiddler beetle (*Prepodes vittatus*), which is specially injurious to orange. It is suggested that sunflowers be planted as a trap crop near orange groves.

Short notes on some insects, F. W. HILGENDORF (*Trans. and Proc. New Zealand Inst., 35 (1902), pp. 264–267*).—*Rhizobius graminis* is reported as injurious to grass roots, upon which it feeds. Notes are also given on *Plutella cruciferarum*, bumblebees, and other insects.

The Mexican cotton-boll weevil, W. C. STUBBS (*Louisiana Stas. Circ. 1, pp. 10, figs. 3, map 1*).—The boll weevil recently appeared on the experiment station grounds at Audubon Park, New Orleans, and drastic measures were taken for eradicating it. The crop of infested cotton was pulled up, dipped in kerosene, and burned; the soil was then saturated with kerosene and fired, after which it was flooded for several days. Cotton planters are urged to give close attention to their crop in order to detect the presence of the weevil at once. A brief account is given of the life history, habits, and appearance of the insect.

The Colorado potato beetle, G. W. HERRICK (*Mississippi Sta. Bul. 81, pp. 8, figs. 5*).—It is reported that this insect now occurs over all parts of the State, even to the gulf shore. Notes are given on the habits and life history of the beetle. A species of ladybug was observed feeding upon the eggs and larvæ of this pest. Arsenate of lead was used in spraying experiments, at the rate of 4 lbs. to 50 gal. of water. One application was quite effective in destroying the insects. Similar results were obtained from the use of Disparene. Brief notes are given on the methods of preparing and applying these insecticides.

The principal insect enemies of the sugar beet, F. H. CHITTENDEN (*U. S. Dept. Agr. Rpt. 74, pp. 157–221, figs. 65*).—An elaborate account is presented of the most important insect enemies of the sugar beet. These include species of flea-beetles, rootworms, carrion beetles, blister beetles, cutworms, army worm, webworms, zebra caterpillar, locusts, spinach-leaf miner, tarnished plant bug, leaf hoppers, plant lice, white grubs, wireworms, red spider (*Tetranychus bimaculatus*), etc. The various remedies which have proved effective and practical in the control of these insects are mentioned in connection with the discussion of each species.

Fungi parasitic upon Cleonus punctiventris, J. DANYSZ and K. WIZE (*Ann. Inst. Pasteur, 17 (1903), No. 6, pp. 421–446, figs. 2*).—Notes are given on the habits and life history of this enemy of sugar beets, with special reference to the requirements for the successful remedy to control the insect. A number of parasitic fungi are known to attack this pest, and special mention is made of *Oospora destructrix*, *Sorosporella uvella*, *Isaria farinosa*, and *Sporotrichum globuliferum*.

A number of experiments were made in distributing cultures of Oospora in sugar-beet fields infested with Cleonus. While the results were not all that could have been desired, the authors believe that they will be more apparent later and that the method is to be recommended on the ground that the soil will gradually become infected with the parasitic fungus and will thus have a tendency to destroy the beetles.

The root borer of sugar cane, N. B. WATSON (*West Indian Bul., 4 (1903), No. 1, pp. 37–47, figs. 3*).—Notes are given on the appearance, habits, and life history of *Diaprepes abbreviatus*. The insect is described in its various stages, and the different stages in its life history are presented in a tabular form. A number of natural enemies are known to attack this pest. The artificial remedies recommended by the author include the planting of sweet potatoes near the sugar-cane field as a trap for the beetles, and the direct use of lime as an insecticide.

The codling moth in Australia, A. DESPEISSIS (*Jour. Dept. Agr. West Australia, 7 (1903), No. 2, pp. 87–98, fig. 1*).—Until recently Western Australia has been comparatively free from the codling moth. This was due to special efforts which were made by the provincial government in preventing its introduction. Notes are given on the distribution of the codling moth in various parts of Australia, the insect is described in its various stages, and a brief account is presented of the extent of damage done by the insect. The life history of the codling moth in Australia and the external evidences of infestation are also discussed.

In combating this pest the author recommends that all rubbish in orchards, especially windfall apples, should be destroyed, that bandages be applied to the trees and regularly inspected for the detection of the larvæ, and that arsenical sprays be applied at the proper seasons. The author recommends the use of Paris green, London

purple, and arsenite of lead. Notes are also given on the natural enemies of the codling moth.

Arsenical spraying against codling moth, 1902-3, G. QUINN (*Jour. Agr. and Ind. South Australia, 6 (1903), No. 12, pp. 717–736, figs. 5*).—Extensive spraying experiments with arsenical poisons have been conducted in various parts of Australia by the fruit inspectors in combating codling moth. Detailed notes are given by the author on the conditions which prevail in different parts of Australia and on the spraying apparatus used, and other points connected with spraying operations. At the close of one test it was found that 10 per cent of the apples from trees sprayed with Paris green were infested, 5.3 per cent from those sprayed with Kedzie's formula, while 42.3 per cent of unsprayed trees were infested with codling moth. The stock solution of Kedzie's arsenite of soda was used at the rate of 1 lb. in 40 gal. limewater.

Fruit fly, G. BUCHANAN (*Jour. Dept. Agr. West Australia, 7 (1903), No. 2, pp. 109, 110*).—This insect is said to have increased in numbers greatly during the past 6 years. A test was made of the starving-out method in destroying this pest. For this purpose the fruit was removed from the trees. As a result of this action it is reported that the depredations from the fruit fly were greatly diminished during the following season.

San José scale, C. A. KEFFER (*Tennessee Sta. Bul., Vol. XVI, No. 2, pp. 23–32, figs. 9*).—This insect is said to be quite generally distributed throughout the State. The pest is described in its various stages and notes are given on insecticide experiments. These included tests of crude petroleum, lime, sulphur and salt, and lime, sulphur, and caustic soda solutions.

Crude petroleum was applied in a mechanical mixture with water in a 20 to 25 per cent solution, and also in a 10 per cent solution. Considerable difficulty was experienced in securing a constant percentage of the oil by means of the ordinary spray pumps, and in some instances the trees were injured or even killed outright. The oil was sprayed upon apple, cherry, peach, pear, and plum trees. Peach trees were most injured by applications of crude oil. In 1 experiment undiluted crude oil was sprayed on a pear tree, with the result that the tree was killed.

Lime-sulphur-salt wash, made according to the recommendations of Professor Forbes, of the Illinois Station, and applied hot to cherry, peach, plum, pear, and quince trees, was fully as effective as crude petroleum in destroying the San José scale, although the effects were not manifested so quickly. The trees were, however, not injured in any case. Frequent rains had no effect in removing the insecticide from the trees and the mixture was found to adhere better than crude petroleum. The lime, sulphur, and caustic soda solution proved to be equally effective with the lime, sulphur, and salt solution, adhered quite as long to the trees, and was more easily made, but somewhat more expensive. It is recommended for use on small orchards, while the lime, sulphur, and salt solution is recommended for large commercial orchards.

The destruction of the woolly aphis (*Jour. Agr. Prat., n. ser., 5 (1903), No. 23, p. 727*).—A number of remedies which have been recommended for combating this insect were tried without success. An experiment was then made in treating infested apple trees with a light varnish mixed with a 5 to 10 per cent solution of lysol. Infested parts of the tree were sprayed or painted with a brush. The varnish was prepared with alcohol, and as soon as the alcohol had evaporated the insects were entrapped in the varnish and were destroyed by the action of the lysol. The experiment is regarded as showing the practicability and effectiveness of this method.

Hyponomeuta padella, S. G. DE LAHARPE (*Jour. Agr. Prat., n. ser., 6 (1903), No. 35, pp. 289, 290*).—This insect is described and notes are given on its habits and life history. The caterpillars are extremely voracious, and when occurring in large numbers great damage is done to the foliage of apple trees. Considerable success

has been had in combating this insect by the use of a mixture of nicotine, soap, and water, and also by the use of a mixture of pine tar, caustic soda, ammonia, and water. A number of parasitic insects assists to some extent in checking the extension of the pest.

The rust mite of the orange (*Jour. Jamaica Agr. Soc., 7 (1903), No. 9, pp. 354–356*).—*Phytoptus oleivorus* is reported as greatly injurious to both orange and lemon. The method recommended for combating this mite consists in the application of a sulphur-lye solution to affected trees.

The pith moth (Laverna atra) (*Bd. Agr. [London], Leaflet 90, pp. 3, fig 1*).—This insect is said to be very injurious to fruit trees. Notes are given on its life history. The insect can be controlled to some extent by collecting and destroying dead shoots before the moths emerge in June. Late spraying with Paris green is also recommended.

Insects injurious in cranberry culture, J B Smith (*U. S. Dept. Agr., Farmers' Bul. 178, pp. 32, figs. 12*).—The insects which attack cranberries are classified according as they injure the leaves, stem, or fruit. The species which are most injurious to foliage are *Eudemis vacciniana, Teras minuta, Cecidomyia oxycoccana,* and *Cleora pampinaria;* the most important species injurious to the stem is *Crambus hortuellus;* while the chief insect pests of the cranberry fruit are *Mineola vaccinii* and *Scudderia texensis.* Notes are given on the habits, life history, and means of combating these various species. A number of other less important insect pests are also mentioned and notes are given on cultural methods which are best adapted to prevent insect ravages. It is suggested that an ideal cranberry bog should be as level as possible, not too extensive, and should be conveniently located to reservoirs, with which it should be connected by means of ditches.

Is the fight against phylloxera futile? J. Dufour (*Chron. Agr. Canton Vaud, 16 (1903), No. 13, pp. 375–381*).—In various parts of the Canton de Vaud it is said that this insect is on the increase, despite all measures which have been taken for combating it. Statistics are presented showing the gradual distribution of the pest. The author believes, however, that the fight against this insect should not be given up and presents reasons for holding out the hope that ultimate success may be reached by the use of American vines and approved insecticide methods.

Fumigation for the destruction of the grape-leaf roller, J. Perraud (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 24, pp. 1485–1487*).—Since the larvæ of this insect winter over under the bark of grape trunks, fumigation with sulphur was employed for destroying them. It was found to be quite safe and effective to inclose the trunks in a metallic jacket only slightly larger than the trunks and to burn sulphur in this small space. The larvæ were killed in almost all cases. It is recommended that fumigation should not be practiced under freezing temperature or immediately after rain.

A dipterous parasite of the grapevine flea-beetle, C. Vianey and H. Conte (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 14, p. 326*).—The grapevine flea-beetle is considered one of the worst enemies of grapes in Algeria, and observations made by the authors indicate that the parasitism of this insect by *Degeeria funebris* may assist materially in the destruction of the pest.

Cankerworms, W. M. Munson (*Maine Sta. Bul. 95, pp. 121–124, figs. 2*).—Brief descriptive, economic, and biological notes on spring cankerworm and fall cankerworm. The remedies recommended for this insect include the use of bands of tarred paper or other substances and spraying with Paris green or arsenate of lead.

Departmental notes on insects that affect forestry, II, E. P. Stebbing (*Calcutta: Supt. Govt. Printing, India, 1903, pp. VII+151–334, pls. 13*).—This number is a continuation of the author's extensive notes on forest insects of India (E. S. R., 14, p. 472). A large number of species belonging to various orders of insects are discussed in detail, and the majority of species are excellently illustrated. Many of the

species discussed are new to science and the material contained in the volume is as a rule original, with the observations of the author and his correspondents.

Atlas of forest entomology, E. HENRY (*Atlas d'entomologie forestière. Paris: Berger-Levrault & Co., 1903, 2. ed., pp. 56, pls. 49*).—Illustrations are given of a large number of forest insects belonging to the various orders of insects, together with explanatory notes relating to these species.

The pine beetle (Hylesinus piniperda) (*Bd. Agr. [London], Leaflet 91, pp. 6, figs. 3*).—This is said to be one of the most destructive of forest insects in England. The pest is described and notes are given on its habits and life history. In combating it, it is recommended that certain trees be left as trap trees upon which the eggs are deposited and which may be destroyed together with the insects.

Tree borer (*Jour. Dept. Agr. West Australia, 7 (1903), No. 6, pp. 440, 441, fig. 1*).—Notes on the injuries suffered by eucalyptus from the attacks of insects belonging to the genera Phoracantha and Stigmodera.

Two insect pests, R. A. COOLEY (*Montana Sta. Bul. 46, pp. 107–118, figs. 2*).—Notes are given on the rosebud curculio (*Rhynchites bicolor*), which causes injury to roses in various parts of the State. The beetles appear in June and continue until the latter part of August. The eggs are generally laid in the rosebuds. In some cases hand picking is sufficient to secure relief from this insect, but jarring and spraying with Paris green are also recommended.

A sawfly (*Pontania bozemani*) which folds the leaves of poplar is said to have been steadily increasing in numbers for several years. The insect appears to be native to the State. The adult hibernates among the leaves on the ground and emerges in May to lay its eggs on the young leaves. In combating this species it is recommended that the leaves be gathered and burned in the fall and that the trees be sprayed in July and August with Paris green or arsenate of lead.

The greenhouse aleurodes (Aleurodes vaporariorum) and the strawberry aleurodes (A. packardi), A. W. MORRILL (*Massachusetts Sta. Tech. Bul. 1, pp. 66, pls. 6*).—An elaborate account is presented of the systematic position of the genus Aleurodes and methods of study.

The greenhouse aleurodes is described in detail in all its stages and notes are given on its life history and habits. The eggs hatch within from 10 to 12 days. During the last few days of the pupal life the insect does not feed or increase in size. Experiments made by the author indicate that unfertilized eggs may hatch and develop into adult males. The adult life of the insect may extend over several weeks. Notes are given on the origin, distribution, food plants, and economic importance of this species. Before starting crops in greenhouses in the fall it is recommended that all weeds and other vegetation should be removed from the house.

Experiments were made with a large number of insecticides in combating this insect. Contact insecticides were found to be destructive to larvæ and young pupæ, less so to mature insects, and quite harmless to eggs. Lemon-oil insecticide was easy to prepare, but was too expensive; laundry soap was found to be cheap and fairly effective; Stott's fir-tree-oil soap was altogether too expensive for use; kerosene emulsion proved to be cheap and effective, while Permol kerosene soap was too expensive; Bowker's tree soap was found to be cheap and the most effective of all the contact insecticides; whale-oil soap was almost equally effective.

A number of materials were used for fumigation, including Nicoticide, Bush's Best Brand Fumigating Compound, Thripscide, carbon bisulphid, and hydrocyanic-acid gas. The last named substance proved to be cheapest and the most effective of all materials used in fumigation. Carbon bisulphid required long exposure in order to secure good results and is considered too expensive. While fumigation with hydrocyanic-acid gas is recommended as the most effective insecticide treatment, this may be combined with syringing with contact insecticides.

The strawberry aleurodes was long considered identical with the greenhouse aleurodes. This species is described in its various stages, and notes are given on its life

history and economic importance. The insect does the greatest injury to strawberries in late summer and early fall and has been reported from New York State. Infested strawberry plants should not be introduced into uninfested regions and plants for propagation should be grown in nurseries isolated from the fruiting beds. Old infested fields should be plowed under as soon as the fruit is harvested. When the insect becomes so abundant in fields as to require treatment spraying with kerosene emulsion or whale-oil soap will give good results.

Beneficial parasites, W. B. WALL (*Jour. Dept. Agr. West Australia, 7 (1903), No. 1, pp. 45, 46*).—Short notes on the beneficial effects of ladybirds and other predacious parasitic insects which have been reared and distributed for the purpose of assisting in the control of injurious insects.

The Phasmidæ, or walkingsticks, of the United States, A. N. CAUDELL (*Proc. U. S. Nat. Mus., 26 (1903), pp. 863–885, pls. 4*).—Notes are given on the anatomy of this family of insects and an analytical table is presented to assist in the identification of species belonging to the family. A brief account is presented of the habits and life history of the various species.

Contribution to a knowledge of the Coleopterous fauna of the Lower Rio Grande Valley in Texas and Tamaulipas, C. H. T. TOWNSEND (*Trans. Texas Acad. Sci., 5 (1902), pp. 51–101*).—Notes on the habits, life history, and geographical distribution of a number of beetles which occur in this region, 552 species being listed in the article.

Contribution to a monograph of the insects of the order Thysanoptera inhabiting North America, W. E. HINDS (*Proc. U. S. Nat. Mus., 26 (1903), pp. 79–242, pls. 11*).—The author's investigations on the classification, biology, and means of combating injurious members of this order of insects are systematized in this paper in a monographic form. Notes are given on the history of investigations relating to this order; systematic position of the order; methods of collecting, preserving, and mounting; external anatomy; development; and on beneficial and injurious species. Various species of thrips are found on flowering plants, grasses, and other cultivated plants.

These pests are subject to the attacks of a number of parasites, both of an insect and fungus nature, and to the injurious effects of unfavorable climatic conditions. They may be combated directly by means of whale-oil soap or other contact insecticides and by cultural methods. A bibliography of 480 titles relating to this order of insects is appended to the article.

Grasshopper destruction and white ants, H. TRYON (*Queensland Agr. Jour., 13 (1903), No. 3, pp. 282–285*).—Notes on the prevalence, life history, and means of combating grasshoppers and white ants. The methods recommended for grasshoppers include various mechanical devices, the use of poison baits, and spraying with arsenical preparations and contact insecticides. Where the white ant colonies are accessible it is possible to dig them up and destroy the ants, or to apply water or contact insecticides.

The destruction of white ants, A. LOIR (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 21, pp. 1290, 1291*).—Various remedies were tested in the destruction of these insects. The best results were obtained from the use of sulphur fumes, which were drawn through the galleries of the white ants by suction, after introducing a tube into either end of the gallery.

The white ant city, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14 (1903), No. 8, pp. 726–730, pl. 1, figs. 7*).—A popular account of the habits and life history of *Termes lacteus*.

Flies, E. L. MOORE (*South Dakota Sta. Bul. 81, pp. 41, 42*).—A mixture containing fish oil, oil of tar, and crude carbolic acid is recommended for ridding animals of flies. This mixture was prepared at a cost of about 35 cts. per gallon and was applied by means of a hand spray pump. One application was found to be effective for 2 days. The milk was not tainted by the odors of the insecticide.

The structure and biology of Anopheles, G. H. F. NUTTALL and A. E. SHIPLEY (*Jour. Hyg. [Cambridge], 3 (1903), No. 2, pp. 166-215, pls. 4*).—Notes are given on the gross and microscopic anatomy of the digestive organs of Anopheles and experiments were made in testing the action of the salivary secretion of *Culex pipiens*. A bibliography relating to mosquitoes is appended to the article.

Mosquitoes and malaria, W. E. BRITTON (*Connecticut State Bd. Agr. Rpt. 1902, pp. 245-252*).—Brief notes on the habits and life history of mosquitoes with special reference to their agency in spreading malaria and means of combating them.

Mosquitoes and suggestions for their extermination, W. L. UNDERWOOD (*Pop. Sci. Mo., 63 (1903), No. 5, pp. 453-466, figs. 15*).—The author presents a popular account of the chief features in the life history of mosquitoes of various genera, including Culex, Anopheles, Eucorethra, etc. *E. underwoodi* is described in its various stages and notes are given on its larval habits and life history. As a larva it feeds upon the larvæ of other mosquitoes and it is believed to be an important natural help in checking the multiplication of these pests.

Cheese mites, H. TRYON (*Queensland Agr. Jour., 13 (1903), No. 1, pp. 56-58, figs. 3*).—Notes are given on the possible connection between this mite and a skin disease common with persons who handle cheese. The mite is described in its various stages and notes are given on means of combating it. The fumes of sulphur, bisulphid of carbon, and hydrocyanic-acid gas are all effective in destroying this species. Care must be exercised, however, in the use of bisulphid of carbon since otherwise the cheese may become tainted by absorbing this chemical.

Fumigation dosage, C. W. WOODWORTH (*California Sta. Bul. 152, pp. 17, figs. 6*).—The purpose of the studies reported in this bulletin was to determine the reliability of estimates of space in tents as made by the practical fumigators of the State. During this investigation 2,314 trees were measured, representing the estimates of 30 fumigators. The results of this study indicate that "the judgment of all fumigators is thoroughly unreliable." The estimates vary greatly in one direction or the other, the fairly good result obtained by different fumigators showing conclusively that the process of fumigation allows a wide margin of variation in the quantity of gas employed.

The author recommends a simple apparatus for measuring the volume of tents before the chemicals are placed in operation. It was found that the leakage of gas was greatest during moist days or when the tent was wet, and that this leakage was of such importance that allowance should be made for it in estimating the quantity of chemicals.

Arsenical insecticides, G. E. COLBY (*California Sta. Bul. 151, pp. 38, figs. 10*).—The author estimates that about 25 tons of Paris green are used annually in combating insects on the Pacific Coast. Tables are given showing analyses of Paris green made before and after the passage of the California law governing the sale of this chemical. Of the samples examined before the passage of the law only 20 per cent was satisfactory in composition; while in the second group 46 were satisfactory and 45 objectionable. In the examination of Paris green it is stated that any great variation in color, especially a pale shade, is an indication of adulteration, and the same may be said for any tendency to caking. The method of microscopical examination is briefly described. The amount of soluble arsenious oxid found in 50 samples of satisfactory Paris green varied from 1.69 to 4.09 per cent, while in 54 samples of objectionable Paris green this ingredient ranged from 4.7 to 29.4 per cent. Detailed notes are given on the method of determining soluble arsenious oxid and copper oxid in Paris green.

Analyses were made of a large number of arsenicals which have been proposed as substitutes for Paris green. Paragrene was found to contain nearly ¼ of its weight of soluble arsenious oxid; Laurel green is not recommended for spraying under any conditions, since the material was found to consist chiefly of gypsum and green sand;

Calco-green proved to be unsafe on account of the large amount of soluble arsenic; Gray Arsenoid and White Arsenoid are objected to on the same basis; Green Arsenoid contains the guaranteed amount of arsenious oxid, but too much of it is soluble; no objections were made to Pink Arsenoid, which was found to be no more dangerous to foliage than Paris green. The majority of these substitutes for Paris green are thus condemned. Home-made arsenicals, however, especially arsenate of lead, arsenite of lead, and the various lime compounds of arsenic are highly recommended. Disparene proved to be equally as effective as arsenate of lead, but it was found difficult to break up the paste and mix it thoroughly with water.

A table is presented showing the relative power of different arsenicals to remain in suspension. Coarse Paris green was found to remain in suspension for the shortest period, and lead arsenite the longest. Notes are also given on the cost of preparing various forms of arsenical sprays. The author recommends the extensive use of insoluble arsenate of lead, arsenite of lead, and arsenite of calcium.

Fungicides, insecticides, and spraying calendar, R. E. Rose (*Mo. Bul. Florida Dept. Agr., 13 (1903), No. 83, pp. 39–53*).—Formulas are presented for the preparation of approved insecticides and fungicides and combinations of these. A spraying calendar is also given, showing the time of application of various remedies for the more common insect and fungus diseases of cultivated plants.

Silk culture in Manchuria, H. B. Miller (*U. S. Consular Rpts., 73 (1903), No 277, pp. 274, 275*).—The amount of silk exported from Manchuria is said to be very large, although definite data can not be obtained. The autumn cocoons are kept over winter and silkworms are hatched in April. The worms are allowed to feed on the native scrub oak which is planted on rough hilly ground. The removal of the silk from the cocoon is accomplished by hand work.

Annual report of the Beekeepers' Association of the Province of Ontario for 1902 (*Ann. Rpt. Beekeepers' Assn. Ontario, 1902, pp. 84*).—At the 23rd annual meeting of the Ontario Beekeepers' Association, held at Barrie, December 16–18, 1902, a number of papers were read, a few of which are briefly mentioned in the following notes. J. D. Evans in his presidential address called attention to the importance of the association and the benefits to be derived from a large attendance and active participation in the various discussions.

J. L. Byer read a paper on market reports, in which attention was called to the necessity of giving close heed to these reports in order to avoid unwise sales as a result of sensational accounts of variations in prices. R. F. Whitesides discussed briefly the operations which are necessary in the successful management of bees in spring.

J. Fixter reported on experiments which were undertaken to determine whether bees injure sound fruit. It was found that under ordinary circumstances they do not. Experiments with brood foundation of different sizes indicated that full sheets of foundation should be used, both in sections in the supers and in the frames of the brood chambers.

F. T. Shutt read a paper on honey from capped and uncapped comb. The author found that honey from uncapped comb shows a somewhat higher moisture content and that the keeping qualities of ripe honey are superior to the immature honey in uncapped comb.

W. McEvoy discussed a method of treating foul brood. He recommended that the combs be removed in the evening and the bees shaken into their own hives, which should be provided with frames with foundation starters. After four days these frames should be removed and the bees given a fresh set of frames with foundation. It is believed that all infection with foul brood will thus be eliminated.

Parthenogenesis in bees, E. Pflüger (*Arch. Physiol. [Pflüger], 99 (1903), No. 3–4, pp. 243, 244*).—Arguments are presented against the assumption of the possibility of parthenogenesis in bees. The author believes that the cases of apparent

parthenogenesis in bees and other insects are better explained by the assumption of hermaphroditism.

Partitions in beehives, J. Crépieux-Jamin (*Rev. Internat. Apicult., 25 (1903), No. 9, pp. 162–165*).—Notes on the importance of partitions between the frames of beehives and the relationship of these structures to the preservation of warmth in the bee colonies.

Report of the bee inspector, J. Sutton (*Jour. Dept. Agr. West Australia, 7 (1903), Nos. 1, pp. 22–25; 3, pp. 177–179*).—Brief notes on the conditions of bee raising in various parts of Western Australia, together with recommendations regarding the care and management of bees.

FOODS—NUTRITION.

The baker's book, E. Braun (*New York: D. Van Nostrand Co., 1903, vol. 2, pp. 307–671, pls. 9, figs. 212*).—As was the case with the preceding volume (E. S. R., 14, p. 1102), this second volume summarizes information of use to bakers and others interested in this trade. The material has been gathered from a variety of sources, and includes recipes and practical directions for making various sorts of bread, as well as miscellaneous articles on a variety of topics connected with bread and bread making.

The complete cookbook, Marion Harland (*Indianapolis: The Bobbs-Merrill Co., 1903, pp. XIV+780, pls. 33, figs. 16*).—In addition to a large number of recipes for various foods, beverages, etc., which it is said have been carefully tested, this volume contains discussions on marketing, carving, kitchen utensils, preparation of foods, and related topics, and furnishes a large amount of useful information.

Breakfast and savory dishes, Florence B. Jack (*London: T. C. & E. C. Jack, 1903, pp. V+142*).—Concise and clear directions are given for the preparation of a number of dishes with eggs, fish, meat, cheese, vegetables, etc.

The art of cooking for invalids, Florence B. Jack (*London: T. C. & E. C. Jack, 1903, 3. ed., pp. VIII+205*).—The author discusses the general problem of cookery for invalids, and gives a number of recipes for preparing suitable dishes, the directions in every case being very explicit. In most cases the time of preparation and the probable cost of the dish are also given.

Treatise on hygiene, P. Smolensky (*Traité d'hygiène. Paris: G. Steinheil, 1904, pp. XXXII+752, figs. 119*).—This volume, which is translated from the Russian by S. Broïdo and A. Zaguelmann, is designed as a laboratory manual for the examination of foods and for the detection of adulteration or sophistication. It treats also of the general principles of nutrition and the principal groups of foods. The extended summary of Russian investigations is an interesting feature, and the work as a whole is a valuable digest of available information on the subjects treated. The volume contains notes by L. Guiraud and A. Gautié, and an extended bibliography, and is thoroughly indexed.

A study of dietaries at Lawrence, Kansas, E. H. S. Bailey (*Trans. Kansas Acad. Sci., 18 (1902), pp. 49–53*).—Two dietary studies with students' clubs at the University of Kansas are briefly reported. During the first study, which covered 1 month, the average cost of the food was 19.5 cts. per person per day, the club including 46 members, one-third being men and two-thirds women students. The fuel value of the diet was 3,923 calories per person per day, and the nutritive ratio about 1:8.

In the second and more recent study the club comprised 22 persons and records were kept for 65 days. The author states that the average cost per person per day was 17.8 cts., the fuel value 3,437 calories, and the nutritive ratio 1:7.6. The number of men and women included in the study is not stated, but from available data it was calculated that there were 10 of the former and 12 of the latter, and that the

average amount of nutrients eaten per day was 99.79 gm. protein, 136.08 gm. fat, and 449.06 gm. carbohydrates.

In another study, regarding which no details are given, it is stated that the average cost of food per person per day was 18.8 cts.

The diet at a Vienna restaurant for young men, M. HAMBURG (*Weiner Klin. Wchnschr., 1902, No. 10, p. 259; abs. in Hyg. Rundschau, 13* (*1903*), *No. 6, pp. 320, 321*).—With the aid of a large number of analyses and other data the author calculates the nutritive value of the diet studied and suggests methods for improving it, as it is regarded as inadequate.

Changes in dietary habits, GROTJAHN (*Ueber Wandlungen in der Volksernährung. Leipzig: Duncker & Humblot, 1902, pp. 72; rev. in Hyg. Rundschau, 13* (*1903*), *No. 4, pp. 193–195*).—In this treatise, which is part 2, volume 20 of the series entitled *Staats- und socialwissenschaftliche Forschungen*, edited by G. Schmoller, the effect of occupation and environment upon diet is discussed.

The food of the Italians, H. LICHTENFELT (*Arch. Physiol.* [*Pflüger*], *99* (*1903*), *No. 1–2, pp. 1–29*).—On the basis of figures given in recent statistical publications the author calculates the nutrients and energy in the diet of Italian laborers of different regions, and discusses the results at considerable length.

Food products of the Tuhoeland, E. BEST (*Trans. and Proc. New Zealand Inst., 35* (*1902*), *pp. 45–111*).—This article contains data regarding the food supplies of the nonagricultural native tribes of New Zealand, as well as notes on native customs, superstitions, etc., pertaining to foods.

Food requirements in winter at high altitudes, RANKE (*München. Med. Wchnschr., 1902, No. 19, p. 787; abs. in Hyg. Rundschau, 13* (*1903*), *No. 11, p. 573*).—A dietary study of which the author was the subject showed that at a high mountain altitude while becoming acclimated he required the same amount of fat and larger quantities of protein and carbohydrates than under usual conditions at a lower elevation.

Subsistence stores, Division of the Philippines, W. L. ALEXANDER (*Com. Gen. Subsist.* [*U. S. Army*] *Rpt. 1903, pp. 21–30*).—The sources of the food supply of the United States troops in the Philippines, the providing of fresh meat, vegetables, and ice, and related topics are discussed in this report.

The chemical composition of human foods graphically shown, C. JÜRGENSEN (*Procentische chemische Zusammensetzung der Nahrungsmittel des Menschen, graphisch dargestellt. Berlin: August Hirschwald, 1903, 2. ed. pp. 23, chart 1*).— A second edition of this work, which contains descriptive text and a colored chart showing the composition of a number of food materials.

Report of State chemist, J. HORTVET (*Minnesota State Dairy and Food Comr. Rpt. 1903, pp. 254–393, figs. 16*).—In compliance with the State law 10,119 samples of foods, condiments, etc., were examined. Of these 3,449 were adulterated or in some way failed to comply with the legal requirements. The report also contains accounts of the cases prosecuted under the State law and data regarding other work carried on during the year.

A plea for the proper medical supervision of "refreshments" purveyed on railways in the Tropics, H. D. McCULLOCH (*British Med. Jour., 1903, No. 2230, pp. 709–711, dgm. 1*).—This article contains considerable data regarding the foods and beverages sold to the traveling public in the Tropics, and points out the need of proper inspection and control.

Bleached wheat compared with unbleached wheat for flour, F. W. GUTHRIE (*Jour. Agr. and Ind. South Australia, 6* (*1903*), *No. 12, p. 759*).—Data are given regarding the yield of flour and other milling products from bleached and unbleached wheat. "The only respects in which the bleached grain is inferior to the unbleached are the weight per bushel and the amount of flour obtainable. The flour itself is very similar in all respects."

The existence of arsenic in hens' eggs, G. BERTRAND (*Ann. Inst. Pasteur, 17 (1903), No. 7, pp. 516–520*).—Minute traces of arsenic were found in the eggs of fowls, geese, and ducks, and the conclusion is drawn that arsenic is contained in appreciable quantity in eggs, the amount varying in the different parts of the egg. On an average the whole egg contained 0.005 mg., two-thirds of which was in the yolk. A goose egg weighing 150 gm. contained about the same quantity as a hen's egg, while a duck's egg weighing 75 gm. contain only 0.002 mg. The author believes that these experiments are of importance in relation to the question of the rôle of arsenic in all living cells.

Examination and valuation of food products containing egg yolk, especially egg noodles and egg cognac, A. JUCKENACK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 18, pp. 827–834*).—The examination of these goods is discussed with special reference to a standard of valuation, the detection of artificial coloring, and related topics.

The normal occurrence of salicylic acid in vegetable food products and the consequent errors which may attend legal analyses, A. DESMOULIÈRE (*Thesis, Paris, 1902; abs. in Bul. Sci. Pharmacol., 4 (1902), pp. 204, 205; Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 16, p. 760*).—In wine 0.08 to 1 mg. of salicylic acid was found per liter, and about 1 mg. per kg. in strawberry and raspberry marmalade, these quantities representing salicylic acid occurring naturally. The method of analyses is described.

Examination of different sorts of cucumbers at various stages of development and of sour pickles made from them, B. HEINZE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), Nos. 12, pp, 529–544; 13, pp. 577–588*).—The author made an extended study of the chemical composition of different sorts of cucumbers, fresh and pickled, and of the changes due to pickling. The process of pickling followed was similar to that used in making sauerkraut; that is, the cucumbers were allowed to ferment with or without the addition of salt.

On an average the small cucumbers weighed 80 to 90 gm., those of medium size 170 to 190 gm., and the ripe cucumbers 857 to 897 gm. As shown by the average values for a number of different varieties, small, medium, and ripe cucumbers had the following percentage composition:

Average composition of cucumbers.

Cucumbers.	Water.	Protein.	Fat.	Sugar.		Nitrogen-free extract.[a]	Crude fiber.	Ash.
				Grape sugar.	Sucrose.			
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Small	96.64	0.81	0.09	....	0.10	1.44	0.58	0.34
Medium	95.82	.68	.09	0.66	.09	1.58	.65	.42
Ripe	95.18	.70	.24	.56	.12	2.06	.74	.42

[a] Aside from the sugar.

Analyses of the pickled cucumbers showed that they contained much less protein and crude fiber than when fresh, the ash being about the same after deducting the added salt. All the grape sugar was rapidly converted into acid, while the cane sugar underwent such change more slowly. Successful fermentation in this method of pickle making, according to the author, depends upon a proper diffusion of sugar in the cucumber juice, the presence of sufficient sugar to form over 0.5 per cent acid, and active lactic-acid-forming bacteria. The micro-organisms present in the fermenting cucumbers were studied in some detail. The article also contains a general discussion and a summary of the literature of the subject.

Some of the constituents of cocoa and their estimation, J. DECKER (*Ueber einige Bestandteile des Kakaos und ihre Bestimmung. Amsterdam: D. J. H. de Bussy, 1902; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 18, pp. 842–844*).—A study of different solvents for theobromin in cocoa shells led to the conclusion that water, ethyl alcohol, and amyl alcohol were most satisfactory, water being preferred for practical reasons. As a means of detecting the presence of shells in powdered cocoa, the author made use of the pentosan content. This ranges, according to his analyses, from 2.17 to 2.41 per cent in the cocoa kernels, and from 8.18 to 9.63 per cent in the shells. Studies were also made of the amount of caffein and theobromin in the leaves of *Theobroma cacao* and *Sterculia cola*, and also of the xanthin derivatives in cocoa shells.

Nitrogenous materials in food substances, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 6 (1903), No. 30, pp. 106, 107*).—The nitrogenous constituents of different seeds are discussed.

The nutritive value of albumins and their derivatives, PLUMIER (*Bul. Acad. Roy. Belg., Cl. Sci., 1902, No. 11, pp. 650–653*).—When dogs were given albumoses and peptones only weight could be maintained, and gains in weight could not be made even if the amount consumed was very large. The products obtained from the complete artificial pancreatic digestion of albuminous bodies were found to be incapable of replacing the albumin in the diet, and the animal perished more quickly when given such materials than when given water only.

The digestibility of the albuminous constituents of human milk and that of various substitutes for it, F. W. TUNNICLIFFE (*Jour. Hyg. [Cambridge], 2 (1902), No. 4, pp. 445–451; abs. in Hyg. Rundschau, 13 (1903), No. 10, p. 525*).—On the basis of analyses and artificial digestion experiments the food value for infants of mothers' milk, cows' milk, and several sorts of modified milk is discussed.

The nature of fibrin ferments, C. A. PEKELHARING and W. HUISKAMP (*Ztschr. Physiol. Chem., 39 (1903), No. 1, pp. 22–30*).—Experimental studies of fibrin ferments are reported.

The preservation of chopped meat with neutral sodium sulphite, E. ALTSCHÜLER (*Arch. Hyg., 48 (1903), No. 22, pp. 114–139*).—A number of experiments, which are reported in detail, led to the conclusion that sodium sulphite acts as a preservative of chopped meat to a certain extent, but that its use is not desirable, since it conceals the true condition of the meat after a time by preventing fermentation yielding bodies of offensive odor, while other sorts of decomposition are not prevented.

The growth and activity of bacteria, and the fermentative processes which take place at low temperature with special reference to flesh foods, M. MÜLLER (*Arch. Hyg., 47 (1903), No. 2, pp. 127–193, figs. 2*).—The micro-organisms and ferments which affect frozen or refrigerated meat or fish were studied experimentally, and the results obtained are discussed at length with special reference to the satisfactory preservation of flesh foods. According to the author, when meat is kept at 0° C. the activity of micro-organisms is checked, but the action of ferments present in the meat still continues and it ripens, though it does not decay. While such meat is especially suited for roasting or broiling, it is not as good as fresh meat for boiling, as the broth has a peculiar flavor.

Fish can not be satisfactorily preserved, it is stated, unless it is actually frozen, since a temperature of 0° C. is not sufficient to hinder the action of the unorganized ferments, although it inhibits micro-organisms. The unorganized ferments produce bodies which are of unpleasant flavor and the fish becomes unpalatable, though it is not decayed. A bibliography is appended to the report.

The nutritive value of sugar for man and animals, L. GRANDEAU (*Ann. Sci. Agron., 2. ser., (1903), 1, No. 1, pp. 1–141*).—From an extended review of the literature of the subject and the experiments which have been reported from time to time, the conclusion is drawn that sugar is a nutrient of great value for man and animals,

especially as a source of energy, and the importance to the sugar industry of encouraging its use is pointed out.

The nutritive value of filled cheese, G. CORNALBA (*Ann. R. Staz. Sper. Caseif. Lodi, 1902, pp. 73–86*).—The nutritive value of filled cheese is discussed on the basis of analyses and artificial digestion experiments.

The capacity of man to perform physical work, M. BLIX (*Skand. Arch. Physiol., 15 (1903), No. 1–2, pp. 122–146, figs. 4*).—A number of experiments are reported. In some of these work was performed with an ergometer of special construction, in others the subjects climbed stairs.

The effect of certain coal-tar colors upon digestion, A. J. WINOGRADOW (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 13, pp. 589–592*).—Even when the amount present was only a few milligrams the following colors markedly diminished or entirely hindered the digestion of protein, according to artificial digestion experiments: Safranin, ponceau *rr*, azofuchsin *g*, orange II, coerulein *s*, phloxin *r. b. n.*, iodeosin, chrysanilin, magdala red, azoflavin, benzopurpurin, and cerise. The following colors were less marked in their action, but could not be called indifferent: Chinolin yellow, methyl green, acid green, iodin green, azoacid yellow *c*, yellow *t*, napthol yellow, anilin green, primulin, auramin *o*, anilin orange, martius yellow, and metanil yellow.

The chemico-physical constitution of mineral waters, W. MEYERHOFFER (*Die chemisch-physikalische Beschaffenheit der Heilquellen. Hamburg and Leipzig: Leopold Voss, 1902, pp. 32, map. 1; rev. in British Med. Jour., 1903, No. 2230, p. 752*).—Among other topics this volume includes matter which has a bearing upon the condition in which mineral matter is assimilated.

The influence of condiments upon the secretion and muscular activity of the stomach, L. R. VON KORCZYNSKI (*Wiener Klin. Wchnschr., 1902, No. 18, p. 468; abs. in Hyg. Rundschau, 13 (1903), No. 6, p. 323*).—Tests in which the stomach contents were removed and examined show that with healthy subjects the condiments studied, namely, paprika, mustard, ginger, pepper, horse-radish, and onions, at first increased and then for a considerable time diminished the stomach secretions, this depression being frequently followed by a second period of stimulation. The muscular activity of the stomach was increased by condiments. Tests were also made with subjects not in normal health.

Standards for flavoring extracts, W. L. SCOVILLE (*Amer. Jour. Pharm., 75 (1903), No. 4, pp. 151–155.*)—According to the author, the only standard that can be legally applied to flavoring extracts is that of wholesomeness, since the delicacy, correctness of flavor, and other qualifications must be determined by individual preference.

Blueberry wine, a natural iron manganese preparation, E. OSTERMAYER (*Pharm. Ztg., 47 (1902), p. 316; abs. in Hyg. Rundschau, 13 (1903), No. 4, p. 201*).—Blueberry wine is stated to contain much larger amounts of manganese and less phosphoric acid than grape wine. Analyses are reported of 2 commercial blueberry wines.

Water cress and typhoid (*British Food Jour., 5 (1903), No. 49, pp. 7, 8.*)—The possible dangers from water cress grown in polluted streams are pointed out.

International catalogue of scientific literature. Q—Physiology (*Internat. Cat. Sci. Lit., 3 (1903), pt. 2, pp. XII + 664*).—This volume of the international catalogue issued by the Royal Society of London contains titles on physiology, including experimental psychology, pharmacology, and experimental pathology. In the case of the various topics connected with the nutrition of man and animals only a very little of the important work published is referred to, although the few articles cited show that an attempt was made to cover these subjects. For instance, out of over 60 feeding experiments with farm animals reported during the period covered by the catalogue less than a dozen are noted.

ANIMAL PRODUCTION.

The isodynamic replacement of nutrients, H. P. ARMSBY (*Science, n. ser., 18 (1903), No. 459, pp. 481–487*).—On the basis of results obtained in experiments with a steer, made with the aid of a respiration calorimeter, the author discusses the replacing value of nutrients and related topics. Since different materials require varying amounts of energy for their assimilation, the fact is pointed out that they are not replaceable in a ration in direct proportion to their theoretical heat value.

The author notes that the error involved in considering food as the fuel of the vital furnace is based on the assumption that "the production of heat in the body is an end in itself. The truth appears to be that it is, in a physiological sense, an incident. The energy of the food is needed for the performance of the vital processes. During these processes it undergoes various transformations, but finally the larger part, or in the resting animal, all is degraded into heat, which incidentally serves to maintain the temperature of the body, and, as it would seem, is amply sufficient for this purpose under a wide range of conditions."

Laboratory manual of animal physiology, E. H. STEIN (*Tierphysiologisches Praktikum. Stuttgart: Ferdinand Enke, 1903, pp. VIII + 144, figs. 20*).—This volume is designed as a laboratory manual for veterinarians and agriculturists, and contains chapters on general methods, nutrients, foods and feeding stuffs, digestion, blood, urine, milk, and butter.

The influence of the retention of bile on gastric digestion, F. D'ANGELO (*Rend. e Mem. R. Accad. Sci., Let. ed. Art. Zelanti Acireale, 3. ser., 1 (1901–2), pp. 24*).—Results of experiments with dogs are reported.

The average composition of the animal body, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 5 (1903), No. 18, pp. 561, 562*).—A brief summary and discussion of analytical data.

The principal constituents of the animal body, water and mineral matters, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 5 (1903), No. 21, pp. 657, 658*).—A summary and discussion.

The iron content of the animal body, M. SCHMEY (*Ztschr. Physiol. Chem., 39 (1903), No. 3–4, pp. 215–282*).—The results of a large number of analyses of different sorts are reported of the flesh of normal animals and those fed iron preparations. The conclusion is drawn that the red color of the muscles of rabbits, chickens, and swine is not determined by the iron content. Feeding iron preparations increased the amount of iron in the body. Data are also given regarding the analyses of the eggs of hens fed on iron preparations.

Stable hygiene, E. A. A. GRANGE (*Breeders' Gaz., 43 (1903), No. 24, pp. 1173, 1174, fig. 1*).—A brief account of the successful use of a ration of 3 qts. of molasses mixed with 6 lbs. of finely chopped hay, fed 3 times a day, for bringing a horse into good condition. At the end of 2 months the horse weighed 1,000 lbs., having made a gain of 90 lbs.

New molasses products in the feeding of farm animals, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 5 (1903), No. 19, pp. 592, 593*).—One of the newer molasses feeds is described.

Sugar, molasses, and molasses products in the feeding of animals, H. VAN DE VENNE (*Brussels: Lamertin; rev. in Ing. Agr. Gembloux, 13 (1903), No. 12, p. 572*).—A summary of available data on the subject.

Sugar cane (*Agr. Jour. and Min. Rec., 6 (1903), No. 15, p. 539*).—The value of sugar cane as a fodder, especially for horses, is pointed out.

Corn silk as a feed stuff, F. D. TAYLOR (*Breeders' Gaz., 44 (1903), No. 15, p. 569*).—Analyses made at the chemical laboratory of the University of Wisconsin of a number of samples of corn silk are reported, in several of which only the protein and water were determined. The average percentage composition was as follows: Water 13.56, protein 18.28, fat 0.95, nitrogen-free extract 46.92, crude fiber 16.6, and

ash 5.06. Corn silk constitutes the principal constituent of screenings from corn elevators, which the author has noted are readily eaten by cows.

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, and F. M. HOLLISTER (*Vermont Sta. Bul. 101, pp. 27–32*).—Data are briefly reported regarding the analyses, made in compliance with the State feeding stuff law, of a number of samples of cotton-seed meal and feed, linseed meal, gluten meals and feeds, distillers' grains (dried), and similar products, wheat offals, poultry feed, calf meal, mixed commercial feeds, and provenders.

The Argentine live stock show, 1902 (*An. Soc. Rural Argentina, 1902, Spec. No., pp. 122, pls. 10, figs. 50, dgm. 1*).—In this bulletin, which is edited by A. Bengolea, the exhibits of the Argentine live stock show held in September, 1902, are described, and much information given regarding the character of horses, sheep, and cattle raised in that country, the present condition and possibilities of the live stock, dairy, and leather industries, etc. An English translation of this publication has been issued by the society under the title of The Argentine Estancia.

The animal industry of Argentina, F. W. BICKNELL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 48, pp. 72, pls. 16*).—With the object of showing the possibilities of Argentina as a market for pure-bred American live stock, the author discusses the opportunities for stock raising in Argentina, the kind of animals raised, and the general business conditions as relating to animal production, and gives data regarding exports and imports, prices obtained for live stock, and related subjects.

Experiments in cattle feeding, J. N. PRICE (*Rpt. Missouri State Bd. Agr., 35 (1902), pp. 261–267*).—Summarizing data obtained in experiments at the Missouri Station, the relative merits of different methods of cattle feeding are discussed. Information was secured from a large number of cattle feeders in Missouri, Iowa, and Illinois regarding the gains made on full feed in winter and summer. On an average the winter gain reported was 2.2 lbs. per steer per day as compared with 2.85 lbs. in summer.

Fattening steers; using cotton seed, cotton-seed meal, wheat meal, wheat straw, and hay (*Oklahoma Sta. Bul. 58, pp. 47*).—*Conditions and results, F. C. Burtis* (pp. 1–38, 42–45).—Methods of feeding cotton-seed mixtures and the length of time they should be fed were studied with 5 lots of 5 steers each, the test covering 105 days in the winter. The lots were all fed in yards with sheds open to the south, and in every case the rations selected were made up in such a way that at a minimum cost they supplied as nearly as possible the nutrients called for by the feeding standards.

Lot 1, on cotton seed and cotton-seed meal, 4 : 1, with wheat straw and prairie hay, gained on an average 1.77 lbs. per head per day, the cost of a pound of gain being 8.8 cts. On wheat meal and cotton-seed meal in about the proportion of 3 : 1, fed with the same coarse fodder as above, lot 2 made an average daily gain per head of 2.62 lbs., the cost of a pound of gain being 8.5 cts. Lot 3 on cotton seed and wheat meal in about the proportion of 2 : 1, with the same coarse fodder, gained 2.07 lbs. per steer per day at a cost of 8.1 cts. When cotton-seed meal and wheat straw 1 : 2 were fed, as in the case of lot 4, one-half the straw being cut and mixed with the meal, the average daily gain was 1.76 lbs. per head and the cost of a pound of gain 9.3 cts. In the case of lot 5, cotton seed was fed with practically an equal amount of coarse fodder (wheat straw and prairie hay), the average daily gain being 1.25 lbs. per head and the cost of a pound of gain 10.5 cts.

The grained consumed per pound of gain ranged from 5.75 lbs. in the case of lot 2 (fed the wheat meal and cotton-seed meal) to 7.32 lbs. in the case of lot 1 (cotton seed and cotton-seed meal). The amount of coarse fodder eaten per pound of gain ranged from 3.82 lbs. with lot 3 (cotton seed and wheat meal) to 10.67 lbs. with lot 5 (cotton seed with wheat straw and prairie hay).

The steers were sold and slaughtered, the net returns per lot ranging from $24.25 with lot 5 to $47.57 with lot 3. The dressed weight ranged from 53.2 per cent with lot 1

(cotton seed and cotton-seed meal) to 57.6 per cent with lot 2 (wheat meal and cotton-seed meal).

There was considerable difference in the lots and none of them was regarded as fully finished, although lots 2 and 3 were considered fairly well fattened. Feeding cotton seed often has an unfavorable effect on the appearance of the flesh, producing a dirty yellow fat, but nothing objectionable was noted as regards the color of the dressed carcass of any of the lots. Throughout the test no serious illness was noted.

Two pigs followed each lot of steers and were fed some wheat meal in addition. The daily gain per pig averaged from 0.71 lb. in the case of those following lot 2 (wheat meal and cotton-seed meal) to 0.95 lb. in the case of those following lot 5 (cotton seed, wheat straw, and prairie hay), and the grain eaten per pound of gain ranged from 3.10 lbs. with the latter lot to 4.13 lbs. with the former. The gains were regarded as very good and as adding much to the net profits. "The fact should be noted that all the pigs lived, and part of them were behind steers that were fed cotton-seed meal as grain."

On the basis of the test, "it is suggested where cotton seed is to be used in the ration of cattle that not more than 8 lbs. of it be fed per day as a maximum amount, and generally 4 to 6 lbs. will prove more satisfactory. In order to use it in the ration of the fattening steer it must be fed with other highly nutritious feeds, and preferably those belonging to the nitrogenous group, as alfalfa or cowpeas. . . .

"While many steers are fattened in the South on cotton-seed meal and cotton-seed hulls, there is no doubt but what, as a rule, much better gains would be procured and at a less cost if some grain as corn, wheat, or Kafir corn were mixed with the cotton-seed meal and hulls, and it is a question if a little of some other roughage besides the hulls should not be used for the best and most economical results."

It is stated that cotton seed and cotton-seed meal are regular constituents of the grain ration of the college and station herd, the rations being so planned that a mature cow will receive not over 2 or 3 lbs. of cotton-seed meal or 3 or 4 lbs. of cotton seed per day, corn or Kafir corn being always mixed with these feeds.

Chemical study of the experiment, *J. Fields* (pp. 39–41, 46).—Analyses are reported of the feeding stuffs used in the above tests.

Experiments on the utilization of skim milk for feeding calves, C. BESANA (*Ann. R. Staz. Sper. Caseif. Lodi, 1902, pp. 17–67, figs. 2*).—The value of skim milk as a feed for calves is discussed, as well as methods of feeding it, and related topics, and a number of experiments are reported in which this material alone or supplemented by starch, oleomargarine, or bone meal was fed to calves.

In the first test, 4 calves gained from 0.475 to 1 kg. per day on skim milk and starch, consuming from 6.77 to 22.36 liters of milk per kilogram of gain. In a second test the average daily gain of 2 calves on skim milk and starch was 0.955 kg. per head and the average consumption of skim milk per kilogram of gain was 12.42 liters, as compared with 0.850 kg. and 12.49 liters on skim milk and oleomargarine. When ground bone and oleomargarine were compared, each being fed to 2 calves, it was found that the average daily gain on the ground bone fed with skim milk was 0.709 kg. per head per day, and on the oleomargarine 0.916 kg., 15.59 liters of skim milk being required per kilogram of gain on the ground-bone ration and 11.82 liters on the oleomargarine ration.

In a 5 weeks' test it was found that 3 calves gained on an average 1.037 kg. per head per day on skim milk and oleomargarine, consuming 12.11 liters of milk per kilogram of gain.

Horse raising, C. BAUVERD (*Jour. Soc. Agr. Suisse Romande, 43 (1902), No. 12 pp. 276–282; 44 (1903), No. 1, pp. 4–11*).—Horse breeding is discussed with special reference to local possibilities and requirements.

The improvement of horse breeding in Jamaica (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 9–10, pp. 193–240*).—Opinions regarding horse and mule breeding in Jamaica were gathered from a number of sources and summarized.

Poultry experiments in 1902, G. M. GOWELL (*Maine Sta. Bul. 93, pp. 69–92, figs. 12*).—The selected breeding tests at the station for egg production have been continued (E. S. R., 13, p. 982). During the 4 years covered by the work more than 1,000 hens have been tested for over 1 year each. Among them 35 were found with an egg record of 200 to 251 per year. Several have produced only 36 to 60 per year, and some others have never laid at all.

As regards the records of pullets in 1901–2, it was found that 55 Barred Plymouth Rocks laid 7,972 eggs during the year, 7 of the individual egg records being from 201 to 240. Forty White Wyandotte pullets in 10 months laid 4,607 eggs. Their average egg record, making allowance for some birds stolen, was 118, and none of these pullets reached the 200 mark. Three of the Plymouth Rock pullets and 6 of the White Wyandottes died during the year. The tests will be continued, using the best stock.

The author notes that many poultrymen believe that if a hen lays only a few eggs the first year, the egg yield will on this account be better during the second year. The data secured does not show that hens producing 120 eggs or less the first year were characterized by a satisfactory egg production the second year. Those which had produced in the neighborhood of 100 eggs the first year produced only a very few the second.

The effect of varying amounts of floor space and other conditions of housing on egg production was also studied. Ninety Barred Plymouth Rocks, kept in one-half of a poultry house and occupying a space 12 by 38 ft., averaged 103 eggs per hen in 11 months. Sixty similar birds, kept in the other half of the house, averaged 109 eggs in the same period. "Where the larger number of birds were together they did not appear to suffer from confinement during winter, as only one bird was lost from November 1 to May 1."

"It is doubtful if there are other lines of investigation where results are likely to be of greater value to practical poultrymen than the study of sizes of flocks and floor spaces for birds. If floor space can be as economically used by leaving it in one large room as by dividing it into several small ones, even though the number of surface feet remains the same per bird, the labor of feeding, cleaning, and egg collecting will be less in the undivided house. Again, the larger room offers greater field for the range of each bird, even though it be more densely populated per surface foot than does the smaller one."

The poultry house in which these lots were kept was closed at night with frames covered with oiled cotton. It was quite cold at night, and the hens did not lay much until March.

In a second test the poultry house was smaller, but was so constructed that it offered much better protection from cold. Fifty birds occupying a floor space of 250 ft. averaged 144.4 eggs each in 10 months. They began to lay in November. The curtained-front house with closet roosting room is inexpensive to construct and is regarded as satisfactory, although it is imperative that the roost room be as near air-tight as practicable when the curtain is down, so that the hens may be warm at night.

During the year a large number of incubator tests were carried out with eggs whose source was definitely known. The data accumulated showed plainly a great variability in the fertility of the total egg yield of different hens, some producing eggs that were all highly fertile and others eggs that were completely infertile. Furthermore, the eggs of some individuals varied greatly in this respect at different times. The observed facts did not indicate that a heavy egg yield was a hindrance to fertility, if the hens were allowed to rest before they began to lay again. "Although in a general way we may regard infertility as likely to result after hens have been laying long and heavily, it is by no means true that it is always so."

Farm poultry, with the results of some experiments in fattening chickens, W. R. GRAHAM (*Ontario Agr. Col. and Expt. Farm Bul. 127, pp. 40, figs. 27*).—A general discussion of feeding, care, management, marketing of poultry, and related topics.

together with some of the results of experiments which have appeared in Canadian station publications.

Artificial incubation and brooding, E. C. HUFFAKER (*Ithaca: Cornell Incubator Mfg. Co., 1903, pp. 48, figs. 25*).—Problems connected with artificial incubation of eggs and related topics are discussed. The pamphlet also includes articles giving directions for operating incubators and brooders by H. H. Blackman and by E. F. Hodgson.

Artificial incubation of chickens, O. M. WATSON (*South Carolina Sta. Bul. 81, pp. 10*).—General directions are given for the management of incubators and the rearing of artificially hatched chickens.

The care of poultry (*La cria de aves. Buenos Ayres: Alejandro Reinhold, 1903, pp. 64, figs. 30*).—A number of general articles on poultry rearing and management, incubators, and related topics are included in this pamphlet.

Methods of caring for and fattening turkeys, W. E. WRIGHT (*Ontario Dept. Agr., Rpts. Live Stock Assocs. 1902, pp. 107, 108*).—On the basis of personal experience directions are given for hatching and feeding turkeys.

Eggs fresh the year round (*Iowa Agr., 3 (1903), No. 6, pp. 166, 167*).—Directions are given for making a modified limewater pickle for use in preserving eggs, which is said to have given satisfactory results.

DAIRY FARMING—DAIRYING.

Feeding dairy cows, J. W. WILSON and H. G. SKINNER (*South Dakota Sta. Bul. 81, pp. 27–40*).—Several feeding stuffs were compared in experiments with grade and pure-bred cows. In the first test 15 cows were divided into 3 lots as nearly uniform as possible, and fed the same kind of grain ration for a period of 27 days. The roughage for lot 1 was corn silage, for lot 2 *Bromus inermis* hay, and for lot 3 alfalfa hay. The data are tabulated and notes are given on the individuality of the cows. During the test lot 1 consumed 1,575 lbs. of silage and 335 lbs. of grain, and produced 25.28 lbs. of butter fat at an average cost of 14.45 cts. per pound; lot 2 consumed 576 lbs. of brome grass hay and 340 lbs. of grain, and produced 24.58 lbs. of butter fat at 14.72 cts. per pound; and lot 3 consumed 389 lbs. of alfalfa hay and 336 lbs. of grain, and produced 19.53 lbs. of butter fat at a cost of 16.35 cts. per pound.

In 2 subsequent periods of 21 days each, spelt, barley, and corn were compared with the same lots, one cow in each, however, being replaced by a fresh one. The roughage was uniform in character during the test. The grain required for the production of 1 lb. of butter fat was, on an average, as follows: Spelt 17.5, corn 15.5, and barley 15.5 lbs. The cows gained in weight when fed spelt or barley and lost when fed corn. Fresh cows produced butter fat with less grain than cows in advanced lactation. The beef-bred cows required one-third more grain to produce a pound of butter fat than the dairy-bred cows.

Economies in dairy farming, E. MATHEWS (*London: Country Life, 1903, pp. XI+68, pls. 39*).—This book is based in part upon tests of over 1,500 cows made during a period of about 10 years, and contains many suggestions relating to the economical production of milk and butter. Some of the subjects discussed are the composition of milk, characteristics of dairy cattle, feeding dairy stock, economical disposal of milk, and hints on butter making. Under characteristics of dairy cattle, the effect of breeding and selection is illustrated by the early history of the Shorthorn and Jersey breeds, and considerable space is devoted to a discussion of the escutcheon. Methods of keeping farm accounts are also described and illustrated.

Elementary treatise on milk and milk hygiene, C. O. JENSEN (*Grundriss der Milchkunde und Milchhygiene. Stuttgart: Ferdinand Enke, 1903, pp. VII+228, figs. 22*).—This is essentially a series of lectures delivered before the Royal Veterinary and Agricultural High School in Copenhagen, parts relating especially to conditions in Den-

mark being omitted. The author discusses milk and its composition, injurious properties which milk may possess, pasteurization and sterilization of milk, preparation of milk for infant feeding, and the public control of the production and handling of milk. A Danish edition of this work is also announced.

Milk from the standpoint of economics and public health (*Die Milch und ihre Bedeutung für Volkswirtschaft und Volksgesundheit. Hamburg: C. Boysen, 1903, pp. 5??*).—This book, which was prepared under the direction of the scientific division of the Public Exhibition for Hygienic Milk Supply at Hamburg, 1903, consists of 19 articles treating in a somewhat popular manner of different subjects related to the public milk supply. A very valuable feature of the work is the extended bibliography accompanying nearly every article.

The different subjects treated are as follows: The Principal Phases in the Historical Development of the Dairy Industry during the Last Ten Years, by W. Kirchner; Statistics of the Cattle Industry and Dairy Industry in Different Countries, by H. Mohr; Elements of Stable Hygiene, by W. Stödter; Feeding Milch Cows, by Noll; The Injurious Effect of Diseases of Cows and of Certain Drugs and Unsuitable Foods with Reference to the Properties of Milk, by F. Glage; The Thorough Cooling of Milk as an Essential in Providing Hygienic Milk, by W. Helm; The Handling of Milk with Especial Reference to the Conditions at Hamburg, by G. H. Sieveking; The Rôle Played by Milk in the Spreading of Typhoid Fever, Diphtheria, and Scarlet Fever, by G. H. Sieveking; Milk and Tuberculosis, by T. Rosatzin; Milk Preservatives and Their Injurious Effects, by C. Hagemann; Milk for Infants and Milk Preparations, by Edlefsen; Infant Mortality and the Milk Supply, by von Ohlen; The Care of Milk in the Home, by W. Weichardt; Cheese Poisoning, by Lochte; The Injurious Effects of Butter and Other Milk Products due to Micro-organisms, by I. Kister; The Saprophytes of Milk and their Relation to Dairying, by H. Weigmann; Pathogenic Ba 'eria in Milk and Milk Products, by H. C. Plaut; Chemistry of Milk, by Eichloff; and Chemical Analysis of Milk, by J. Zink.

Suggestions concerning care of milk and butter making on the farm, H. E. Van Norman (*Indiana Sta. Bul. 96, pp. 36, figs. 8*).—Statistical information is given on the dairy industry in Indiana, and suggestions are made concerning the feeding of cows, care and handling of milk, washing dairy utensils, separation and ripening of cream, churning, weighing, and testing milk, etc. Figures are given showing the fertilizing elements removed in farm products and several pieces of dairy apparatus are illustrated.

Studies on milk hygiene, G. Schweitzer (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 16–17, pp. 501–514; 18–19, pp. 563–570, fig. 1*).—The care of milk in the home is discussed in connection with a report of tests of the Kobrak pasteurizing apparatus, the morphology and culture characteristics of a number of lactic acid bacteria are described; and observations on the souring of milk at different temperatures are reported. A list of 23 references relating to this subject is appended.

Bacteria in milk and its products, M. Henseval (*Les microbes du lait et de ses dérivés. Lierre: J. Van In & Co., 1903, pp. 126; rev. in Rev. Gén. Agron. [Louvain], 12 (1903), No. 5, pp. 236–239*).—Chapters are devoted to the source of bacteria in milk, pasteurization, ripening of cream, the composition of butter and the causes of rancidity, and the ripening of cheese.

Hygiene of milk production, H. Raquet (*Conditions d'hygiène à réaliser dans la production du lait. Brussels: Lamartin, 1902, pp. 80*).

The composition of milk, H. D. Richmond (*Analyst, 28 (1903), No. 3??, pp. ??–292, fig. 1*).—The average fat content of 12,914 samples of milk as received at a milk depot in London during 1902 was 3.82 per cent. The lowest figures were obtained in May, June, and July, and the highest in October, November, and December. The percentage of total solids averaged 12.73 and the average specific gravity was 1.0321.

Paying for separator cream at the creamery, J. L. HILLS (*Vermont Sta. Bul. 100, pp. 24, figs. 3*).—The author believes that there are creameries which neither sample correctly, analyze correctly, nor pay correctly, and he has therefore prepared a bulletin of information containing suggestions in regard to sampling and testing cream, and discussing the paying for cream at creameries receiving both cream and milk. In order to promote the more thorough mixing of the cream sample, moderate warming and the use of a fine sieve and pestle are recommended. Weighing the cream in making a test is urged as the only accurate method.

Patrons furnishing cream are entitled to a larger surplus or a higher price per pound of butter or butter fat than patrons delivering milk for reasons which are clearly set forth. This extra surplus due cream patrons is estimated, upon the basis of a large amount of painstaking comparison in actual creamery practice, as ranging from 2.5 to 5 per cent and averaging about 3 per cent. The extra price is considered usually close to a half cent. Methods of estimating the cream fat and the milk fat surpluses, calculating payments, etc., with concrete examples, are given in an appendix.

The keeping quality of butter, G. L. M'KAY and C. LARSEN (*Iowa Sta. Bul. 71, pp. 30*).—The causes of deterioration in butter are briefly discussed, and experiments to determine whether the keeping quality of butter is affected by its content of moisture and by the quality of the wash water used in its manufacture are reported. The results of experiments with butter made under uniform conditions, except as regards the amount of working, were considered as indicating that the butter containing the smaller amount of moisture possessed the better keeping quality, though the individual experiments did not justify such a conclusion. Incidentally in this connection the authors discuss the effect of working upon the water content of butter, concluding that the proper time to control moisture is before or during churning rather than afterwards.

In each of 3 experiments the butter from one-half of a vat of ripened cream was washed with well water, and the butter from the other half, churned under the same conditions, was washed with well water which had been pasteurized and cooled. In each of 2 experiments 1 portion of the cream was also pasteurized before ripening. Pasteurization of the wash water improved greatly the keeping quality of the butter, and pasteurization of both cream and wash water had a still more favorable effect. In each of 3 other experiments the butter from one-half of a vat of well-ripened cream was not washed at all, while the butter from the other half was washed with unpasteurized well water. The unwashed butter kept as well as the washed butter, and in some instances it kept better. It remained normal for about 40 days.

Where the wash water is not of good quality it is therefore believed that as good or better results can be obtained by working the buttermilk well out of the butter and omitting the washing, providing the cream to be churned is of good quality and the butter can be sold within 35 days after its manufacture. The favorable action of salt upon the keeping quality of butter was also shown in other experiments. Three objectionable flavors, described as a turpentine flavor, a strong cheesy flavor, and a fishy flavor, developed in butter made in these experiments.

The purity of well water in general is briefly discussed. In the unpasteurized well water used in the above experiments the germ content averaged 113 per cubic centimeter, while in the pasteurized water it averaged 3. The methods available for the purification of wash water are filtration and pasteurization. The advantages and disadvantages of each method are considered. Filtration is deemed preferable to pasteurization inasmuch as this method removes organic matter and other impurities as well as bacteria, and is very inexpensive. In the experiments at the station continuous filtration removed 95 per cent of the germs. The filter bed used consisted of the following layers, mentioned in order beginning at the bottom: Coarse gravel 2 in., fine sand 22 in., fine coke 12 in., charcoal 9 in., and coarse gravel 2 in. Sug-

gestions are made concerning the care of filters. The cost of pasteurization of both milk and wash water was estimated at 0.1 ct. per pound of butter produced, not including the cost of the necessary apparatus.

The cold curing of cheese (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 49, pp. 88, pls. 4, figs. 22*).—This is a report upon experiments conducted by the Wisconsin and New York State stations under the auspices of the Dairy Division of the Bureau of Animal Industry.

Introduction, H. E. Alvord (pp. 7-10).—The experiments which have been made in curing cheese at lower temperatures than usual are referred to, and the conditions and objects of the present work are briefly set forth. While the main purpose was to test under commercial conditions the effect of cold curing upon the quality of cheese, data were also secured concerning loss in weight during curing and the use of paraffin in coating cheese. In the experiments conducted by both stations the cheese was cured at temperatures of 40, 50, and 60° F. The following general conclusions are drawn from the two series of experiments: "The loss of moisture is less at low temperatures, and therefore there is more cheese to sell. The commercial quality of cheese cured at low temperatures is better, and this results in giving the cheese a higher market value. Cheese can be held a long time at low temperatures without impairment of quality. By utilizing the combination of paraffining cheese and curing it at low temperatures the greatest economy can be effected."

The western experiments, S. M. Babcock, H. L. Russell, and U. S. Baer (pp. 11-70).—The cheeses used in these experiments were purchased from factories in Wisconsin, Iowa, Illinois, and Michigan, and represented various types, grouped for convenience as follows: (1) Close-bodied, firm, long-keeping type, suitable for export trade; (2) sweet-curd type; (3) soft, open-bodied, quick-curing type, suitable for early consumption. The cheeses were made with uniform quantities of rennet and salt and were shipped to Waterloo, Wisconsin, where they were placed in cold storage at temperatures averaging 36.8, 46.9, and 58.5° F. Representative cheeses were examined at intervals by a jury of commercial experts, their scores being supplemented by scores made much more frequently by U. S. Baer. The data are reported in full in an appendix, and also summarized in the text.

As regards loss in weight, the results show that cheese cured at 50 to 60° lost fully three times as much in 90 days as cheese cured at 40°. Under prevailing factory conditions it is believed that cheese loses fully four times as much in a period of 20 days as was lost during the 90-day period in cold storage. Cheese of type 1 lost much less in weight than cheese of the softer types. At 40° the loss in weight was practically independent of the size of the cheese, this result, however, being attributed to the relative humidity of the curing room, which at that temperature was 100 per cent. At higher temperature the loss in weight increased as the size of the cheese decreased. The shrinkage in cheese coated with paraffin and cured at 60° was more than 50 per cent less than that of uncoated cheese cured at the same temperature. At 40° coated cheese lost slightly more in weight than uncoated cheese. The loss in weight of cheese is not believed to be due wholly to loss of moisture.

As regards the quality of the cheese the results on the whole were decidedly in favor of cold curing. The typical Cheddar cheese constituting type 1 being manufactured nearer to the curing station afforded the best test of the influence of temperature. The cheese of this type ripened at 60° developed faster than cheese at the lower temperature and was of excellent quality, but eventually it was surpassed by the cold-cured cheese. As regards keeping quality, cold-cured cheese was far superior to that ripened at the higher temperature. The quality of the cheese was not affected by the use of paraffin.

"The production of a thoroughly broken-down Cheddar cheese of mild, delicate flavor and perfect texture meets a demand which is impossible to satisfy with cheese cured at high temperatures. Without any question, if the general market can be

supplied with this mild, well-ripened cheese, consumption will be greatly stimulated, not only by increasing the amount used by present consumers, but by largely extending the use of this valuable and nutritious article of food. The improvement in quality of cold-cured cheese, the enhanced keeping quality, and the material saving in shrinkage due to lessened evaporation are sufficient to warrant a considerable expenditure on the part of cheese producers in installing cold-curing stations."

The eastern experiments, L. L. Van Slyke, G. A. Smith, and E. B. Hart (pp. 71–88).—In these experiments representative cheeses were obtained from New York, Pennsylvania, and Ohio, and placed in storage in New York City at temperatures of 40, 50, and 60°. The cheeses were examined by a committee of experts when placed in cold storage and after 10, 20, 28, and 35 weeks. Chemical analyses were also made.

"The loss of weight increased with increase of temperature, being on an average in 20 weeks 3.8 lbs. per 100 lbs. of cheese at 40° F., 4.8 lbs. at 50° F., and 7.8 lbs. at 60° F. The large-sized cheeses lost less weight per 100 lbs. than those of smaller size. Cheese cured at 40° F. was superior in quality to the same kind cured at higher temperatures. That cured at 50° F. was superior in quality to that cured at 60° F. The general averages of the scores at the end of 20 weeks were as follows: 95.7 at 40° F., 94.2 at 50° F., and 91.7 at 60° F. The difference in quality was confined in most cases to flavor and texture, the color and finish being little or not at all affected in cheese that was in good condition at the beginning. The commercial qualities of cheese were favorably influenced after 6 months in the case of that covered with paraffin, especially in flavor. The loss of moisture was greatly lessened, amounting only to a fraction of a pound for 100 lbs. of cheese at 40° and 50° F., and being only about one-fifth the average loss found at 60° F. with cheese not so treated. The cheeses were also perfectly clean and free from mold, while all the cheeses not treated with paraffin were covered with mold."

The paracasein monolactate, averaging 57.47 per cent of the nitrogen in cheese 1 and 2 weeks old, decreased with the age of the cheese and more rapidly at higher than at lower temperatures. This decrease was accompanied by a corresponding increase in the percentage of nitrogen in form of water soluble compounds. The formation of amido and ammonia compounds possibly associated with the development of flavor in cheese increased with temperature and the age of the cheese.

Experiments in curing cheese at different temperatures, L. L. Van Slyke, G. A. Smith, and E. B. Hart (*New York State Sta. Bul. 234, pp. 97–121*).—This is the same report as that noted above under the subtitle The eastern experiments.

Cold cured cheese, II, F. H. Hall, L. L. Van Slyke, G. A. Smith, and E. B. Hart (*New York State Sta. Bul. 234, popular ed., pp. 7*).—A popular summary of the above.

Rennet enzym as a factor in cheese ripening, L. L. Van Slyke, H. A. Harding, and E. B. Hart (*New York State Sta. Bul. 233, pp. 67–96*).—The agencies so far known to take part in the normal ripening of cheese are stated to be (1) acid, usually lactic; (2) enzyms present in the milk; (3) an enzym in the rennet extract added to milk in cheese making; and (4) micro-organisms, chiefly bacteria. The investigations here reported were concerned mainly with the rennet enzym, the object being to ascertain to what extent this ferment causes the formation of soluble nitrogen compounds in cheese during the process of ripening.

In order to study the action of the rennet enzym apart from the other agencies, the milk enzyms were destroyed by heating, a method shown by experiments to be effective, and the growth of micro-organisms was prevented by the use of chloroform. The coagulability of the milk was restored by the use of calcium chlorid or carbon dioxid. The action of the rennet enzym was studied (1) in the presence and absence of acid and of salt in cheese made from milk which had been heated to destroy the milk enzyms and treated with chloroform to prevent the growth of micro-organisms; (2) in the presence of acid and liquefying organisms in cheese

made from pasteurized milk without the addition of chloroform; (3) in cheese containing commercial pepsin and micro-organisms; and (4) in comparison with commercial pepsin on casein in milk and paracasein dilactate. Detailed data for the experiments are given in an appendix. The results are summarized as follows:

"In the case of every experiment made, there was little or no digesting action by either rennet enzym or commercial pepsin in the absence of acid, while the action was marked in the presence of acid.

"In the absence of acid in cheese no paracasein lactate is found, and little or no proteolysis occurs; in the presence of acid in the cheese paracasein monolactate is formed and digestion takes place, the rennet ferment being the active agent. The ability of rennet enzym to convert paracasein into soluble nitrogen compounds appears to depend upon the presence of acid, resulting in the formation of paracasein monolactate.

"Rennet enzym and commercial pepsin act essentially alike in forming soluble nitrogen compounds when compared with each other in the case of cheese, milk, and paracasein dilactate.

"In the case of both rennet enzym and commercial pepsin, the chemical work performed by the ferments is confined mainly to the formation of the paranuclein, caseoses, and peptones, while only small amounts of amids are formed, and no ammonia.

"Rennet enzym is really a peptic ferment.

"Salt, in the proportions found in normal cheese, appears to have little effect upon the action of rennet enzym in cheese ripening. The experiments on this point are, however, not regarded as conclusive.

"The abnormal conditions present in many of the experiments, such as pasteurized milk, calcium chlorid, and chloroform, would tend, if they had any effect at all, to decrease the digestive action of rennet enzym. Our results, therefore, may properly be regarded as representing the minimum effect of rennet enzym in cheese ripening.

"The digestive action of rennet enzym does not appear to extend to the formation of compounds that produce the flavor of cheese."

Conditions affecting chemical changes in cheese ripening, L. L. VAN SLYKE and E. B. HART (*New York State Sta. Bul. 236, pp. 133–163*).—This bulletin gives the results of a study of the chemical changes taking place in the nitrogen compounds of cheese as affected by time, temperature, moisture, size of cheese, salt, rennet, and acid. The casein of milk is converted into paracasein by the action of rennet, after which paracasein monolactate, paranuclein, caseoses, peptones, amido compounds, and ammonia compounds are formed in approximately the order mentioned. The bulletin deals with the quantities of these different compounds, and their relations to one another, in Cheddar cheese, made for the most part according to usual commercial methods and ripened under controlled conditions. From 4 to 8 cheeses, weighing 10 or 30 lbs. each, were made from the same lot of milk in each experiment. Detailed analytical data are given in an appendix, and the results are summarized by the authors as follows:

"The amount of soluble nitrogen compounds increases as cheese ages. The rate of formation of these compounds is more rapid in the earlier stages of ripening, about two-thirds being formed during the first 3 months and over 90 per cent in the first 9 months of an 18-month period of study.

"Soluble nitrogen compounds increase in cheese ripening quite closely in proportion to increase of temperature. Between the limits of 32° F. and 70° F. there was an increase of 0.5 per cent of soluble nitrogen compounds for an increase of one degree of temperature. The amido compounds and ammonia were more abundantly formed, and they steadily accumulated in cheese cured at higher temperatures.

"Cheese containing more moisture, other conditions being uniform, generally contains larger amounts of soluble nitrogen compounds, especially after the early stages of ripening.

"Cheeses of large size usually form soluble nitrogen compounds more rapidly than smaller cheeses under the same conditions, because large cheeses have a higher water content after the early period of ripening.

"Cheese containing more salt forms soluble nitrogen compounds more slowly than cheese containing less salt. This appears to be due, in part, to the direct action of salt in retarding the activity of one or more of the ripening agents, and in part to the tendency of the salt to reduce the moisture content of the cheese.

"The use of increased amounts of rennet extract in cheese making, other conditions being uniform, results in producing increased quantities of soluble nitrogen compounds in a given period of time, especially such compounds as paranuclein, caseoses, and peptones.

"Acid is necessary for the formation of paracasein monolactate, from which soluble nitrogen compounds appear to be formed in normal cheese ripening; but the exact relation of varying quantities of acid to the chemical changes of the ripening process has not yet been fully studied.

"Paracasein, caseoses, and peptones usually vary within small limits and do not usually accumulate in cheese in increasing quantities, but after a while decrease, while amids and ammonia are found to accumulate continuously during the normal ripening process. Low temperatures favor some accumulation of the transient products, while high temperatures favor the more rapid accumulation of amids and ammonia.

"The accumulation of soluble nitrogen compounds in cheese appears to diminish the action of the agents causing the changes, so that cheese ripens less rapidly after the first period.

"An increased moisture content in cheese favors more active chemical change for two reasons: (1) Moisture in itself favors the activity of ripening ferments; (2) the presence of increased amounts of moisture serves to dilute the fermentation products that accumulate.

"The conditions of the manufacture of cheese and of ripening determine the rapidity and extent to which chemical changes take place in the nitrogen compounds during ripening. The following conditions promote more rapid change: (1) Increase of temperature in ripening; (2) larger amount of rennet; (3) higher moisture content of cheese; (4) decreased amount of salt; (5) large size of cheese, and (6) moderate amount of acid. Cheese made and handled so as to ripen slowly is of higher commercial value."

The regular appearance of different types of strictly anaerobic butyric-acid bacteria in hard cheese, A. RODELLA (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 16–17, pp. 499, 500; 24–25, pp. 753–755*).—In these two articles, with slightly different titles, the author reports the regular occurrence in numerous samples of several kinds of hard cheese of anaerobic bacteria, especially forms capable of producing butyric-acid fermentation, and describes briefly the methods used in their isolation and culture. It is the author's purpose to discuss the relation of the butyric-acid bacteria to the ripening of cheese in a concluding article.

How can the East compete with the West in dairying? J. L. HILLS (*New Jersey State Bd. Agr. Rpt., 1902, pp. 175–201*).

VETERINARY SCIENCE AND PRACTICE.

Immunity and immunization, L. HOPF (*Immunität und Immunisirung. Tübingen: Franz Pietzcker, 1902, pp. VI+96*).—A general account of the subject of immunity from a historical standpoint. The author discusses immunity toward various poisons as well as toward infectious diseases. Notes are given on the methods of immunization and on the theories of immunity which have prevailed among various civilized and uncivilized races. The latter part of the volume is devoted to a discussion of the nature of immunity as understood from the recent investigations of bacteriologists.

Immunity in infectious diseases, E. METCHNIKOFF (*L'immunité dans les maladies infectieuses. Paris: Masson & Co., 1901, pp. IX+600, figs. 45*).—This volume contains an elaborate discussion of the general problem of immunity. The subjects discussed by the author include the importance of a study of immunity; immunity in unicellular organisms, in plants, in the animal kingdom; resorption of organized elements; resorption of albuminoid fluids; natural immunity against pathogenic organisms; the mechanism of natural immunity; a review of the facts of acquired immunity; rapid and temporary immunity conferred by specific and normal sera; natural and artificial immunity against toxins; immunity of the skin and mucous membranes; preventive vaccination for sheep pox, rabies, rinderpest, anthrax, blackleg, swine erysipelas, pleuro-pneumonia, tetanus, diphtheria, etc.; and a historical review of the present knowledge of immunity. The volume concludes with a résumé of the whole subject as viewed from the author's standpoint.

Toxins and antitoxins, J. BORDET (*Ann. Inst. Pasteur, 17 (1903), No. 3, pp. 161-186*).—A review of the literature of this subject indicates that the majority of authors are agreed on the proposition that antitoxins do not produce immunity by direct action upon the animal organism, but that their chief action is a partial neutralization of toxins. It has been shown, however, that a mixture of a toxin and an antitoxin is not strictly neutral, and portions of both toxin and antitoxin remain uncombined, while the remainder of the toxin and antitoxin combines and becomes neutralized in varying degrees.

The author briefly discusses the results of an experiment with an alexin and an antialexin. It is found that a quantity of antialexin insufficient for completely neutralizing more than 6 fatal doses of alexin, nevertheless exercises an influence such that in its presence 24 fatal doses of alexin produce hemolysis less rapidly than a single dose is capable of doing in the absence of the antialexin.

Cellular hemolysins, C. LEVADITI (*Ann. Inst. Pasteur, 17 (1903), No. 3, pp. 187-216*).—The objects of the experiments reported by the author in this paper were to determine the nature and method of production of hemolysins and the relative activity of macrophages and polynuclear leucocytes in the production of hemolysins. The extracts were obtained from the 2 kinds of leucocytes by a rapid and slow process.

Experiments were then made with these hemolysins as obtained by the different methods. It was found that the principal hemolysins contained in the extract obtained by the slow method were soluble in dilute and strong alcohol. The hemolysins obtained from the lymphatic ganglia can not, in the opinion of the author, be identified with the cytase of fresh sera, since the former are thermostable and may be neutralized by normal serum. It was shown during the author's experiments that the extract of polynuclear leucocytes is quite deprived of hemolytic properties with regard to the red corpuscles.

The bacteriolytic properties of this extract, however, were considerably more pronounced than those of the extract from the macrophages. It appears therefore that the macrophages of the lymphatic ganglia, as a result of the autolytic properties and the composition of the cytase in the ganglia, are an important source of hemolysins, while the polynuclear leucocytes in the peritoneal fluid are without any trace of hemolytic properties which can be demonstrated in vitro. The polynuclear leucocytes, however, play the principal part in the destruction of bacteria.

On some factors in bacteriolytic action, E. W. A. WALKER (*Jour. Hyg. [Cambridge], 3 (1903), No. 1, pp. 52-67*).—A study was made of the bacteriolytic properties of rabbit serum after inoculation with typhoid bacillus. It was found that the amount of complement in the serum undergoes a steady increase during the first few hours, provided the serum be left in contact with the clot. Serum removed from a vessel containing the clot, however, shows no such increase in the complement. It is concluded, therefore, that the complement is a product of leucocytes appearing in the blood plasma or serum as the result of the disintegration of the leucocytes.

The existence of hemolytic alexin in the blood plasma, A. FALLOISE (*Bul. Acad. Roy. Belg. Cl. Sci., 1903, No. 6, pp. 521–596*).—The author conducted experiments upon a number of mammals and birds, including dogs, rabbits, cattle, sheep, pigs, pigeons, and other species of birds. The results obtained indicate that an alexin exists in the blood plasma in all these animals. This alexin was found without regard to whether the blood had been treated with a chemical reagent or not. It is argued, therefore, that this alexin is secreted by the leucocytes in the circulating blood, and that these blood elements therefore play an important part in immunity.

The active substance of normal sera—The plurality of alexins, L. REMY (*Ann. Inst. Pasteur, 17 (1903), No. 5, pp. 343–356*).—During these experiments, which were conducted chiefly with the serum of rats, it was found that the serum of these animals when not heated exercises a destructive influence upon the majority of bacteria. The action of a temperature of 55 to 56° C. for 35 minutes attenuates without destroying the bactericidal properties of the serum. The bactericidal substance which resists the action of heat is an alexin. This alexin in the serum of rats resists a temperature of 55 to 56° C., and is therefore considered not to be hemolytic, since it does not have the power of enforcing hemosera.

Staphylococci and staphylolysin, P. VAN DURME (*Hyg. Rundschau, 13 (1903), No. 2, pp. 66–68*).—Experiments with different species of Staphylococci showed that there is a close connection between the pathogenic action and the hemolytic power of these organisms. The formation of hemolysin is much less extensive in the case of *S. albus*, as might be expected from its slighter pathogenic power.

Successful treatment of fatal intraperitoneal streptococcal infections in rabbits by means of injections of pyocyanase, R. EMMERICH and R. TROMMSDORFF, *Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 8, Orig., pp. 627–633, figs. 2*).—During a series of experiments by the authors it was found that 31 per cent of rabbits treated with pyocyanase successfully resisted fatal intraperitoneal doses of streptococci, and 46 per cent of the rabbits thus treated were favorably influenced by the treatment, but ultimately succumbed to the infection.

The influence of diphtheria and tetanus toxins on hemoglobin and on the morphology and specific gravity of the blood, H. KUCHARZEWSKI (*Centbl. Bakt. u. Par., 1. Abt., 34 (1903), No. 4, Orig., pp. 381–384*).—The experiments reported in this paper were made on rabbits. It was found that the diphtheria toxin in large or medium doses caused a diminution in the number of red blood corpuscles and in the quantity of hemoglobin. Small doses were without effect. When large doses of toxin were used the density of the blood was increased and a hyperleucocytosis was observed. Inoculation with tetanus toxin also diminished the number of red blood corpuscles and the quantity of hemoglobin, and diminished the density of the blood.

Antiferments, E. WEINLAND (*Ztschr. Biol., 44 (1902), No. 1, pp. 1–15*).—The purpose of the experiments reported in this paper was to determine the cause of resistance of intestinal worms to the action of the digestive juices of the host animals. The worms upon which experiments were made included cysticerci of a number of species, *Ascaris suilla*, *Tænia expansa*, and *T. mediocanellata*. An antiferment was extracted from the bodies of the worms, which had the effect of protecting fibrin and other readily digestible substances against the action of proteolytic ferments. The protection furnished by the antiferment was not unlimited in time or extent, but was sufficiently pronounced to indicate that the antiferment was capable of protecting the parasitic worms against the action of digestive juices. The antiferment was not readily extracted. A second extract contained more of the antiferment than the first.

The nonidentity of agglutinins acting upon the flagella and upon the body of bacteria, T. SMITH and A. L. REAGH (*Jour. Med. Research, 10 (1903), No. 1, pp. 89–100*).—During a series of experiments made by the authors it was found that the

nonmotile and the motile races of hog-cholera bacillus and also *Bacillus icteroides* show a close affinity in the presence of immune agglutinins. The action of the serum of rabbits and guinea pigs immunized with the nonmotile bacillus is quite different toward this bacillus from the action of serum produced by motile bacilli. The clumping appears later and in the form of a precipitate of granules. Agglutination appears also only after a higher degree of immunization.

During these studies it was found that the agglutinin which acts upon the flagella is quite distinct from that which acts upon the body of bacteria. The agglutinin which is active toward the bodies of nonmotile hog-cholera bacilli was found to be identical with that which acts upon the bodies of the motile race of the same species. A much higher degree of immunity is required in the experimental animal in order to obtain the agglutinin which operates upon the body of the bacilli, while flagellar agglutinins are quite easily demonstrated in the immune sera.

The agglutination affinities of related bacteria parasitic in different hosts, T. SMITH and A. L. REAGH (*Jour. Med. Research, 9 (1903), No. 3, pp. 270–300*).—An elaborate study was made of bacilli belonging to the hog cholera group of both motile and nonmotile forms. The organisms studied included typhoid bacillus, coli bacillus, *Bacillus icteroides*, hog-cholera bacillus, etc. During these investigations it was found that there are certain agglutination relationships between pathogenic bacilli which cause fermentation of dextrose. The agglutinative characters appear to be modified when the organism becomes parasitic upon different hosts. It was found possible to predict agglutinative affinities from close pathogenic relationships. Guinea pigs immunized with the same cultures in the same manner yielded sera with identical agglutinins.

The appearance of agglutinins after cutaneous infection, W. HOFFMANN (*Hyg. Rundschau, 13 (1903), No. 3, pp. 114–121*).—The author conducted experiments for the purpose of determining whether it was possible to produce agglutinins in the blood serum as a result of mere cutaneous inoculation. The experiments demonstrated that agglutinins are produced in rabbits after cutaneous inoculation with typhoid bacillus. The agglutinative standard is not as high as that which is secured by intravenous injections.

The agglutinating properties of bile, A. CANTANI (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 9, Orig., pp. 730–740*).—The author made a large number of experiments for the purpose of determining the possible agglutinating power of the bile from normal and affected animals. It was found during these experiments that the bile of normal rabbits, guinea pigs, and cattle possesses no agglutinating properties toward the majority of bacteria, while the bile of dogs exhibits slight agglutinating action. A pronounced power was observed in the bile of animals which had been immunized against certain bacterial organisms, such as the typhus and coli bacilli.

The bactericidal action of the bone marrow and the etiology of osteomyelitis, A. HENCKE (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 9, Orig., pp. 697–701*).—During the author's experiments, which were made chiefly on rabbits, it was found that the bone marrow possesses quite striking bactericidal properties. It recovers from infection more quickly and completely than the internal organs. *Staphylococcus aureus* introduced in pure cultures into the animal organism, whether into the blood or into the bone marrow, failed to produce an infectious osteomyelitis. In 4 spontaneous cases of this disease investigated by the author, in which there was no communication with the outside world, and in 1 case in which the communication existed, small bacterial rods were found and were isolated in pure cultures. These cultures were found to be capable of producing characteristic osteomyelitis when inoculated intravenously.

Determination of the bactericidal and antiseptic action of Bacillol, L. HAUMAN (*Ing. Agr. Gembloux, 13 (1903), No. 12, pp. 541–546*).—A number of experiments were made for the purpose of determining the antiseptic power of Bacillol upon the

various micro-organisms, including *Bacillus coli communis*, anthrax bacillus, typhoid bacillus, *Penicillium glaucum*, etc. It was found that this substance compared favorably in antiseptic power with carbolic acid and was more readily applied. It is less offensive in odor and presents no dangers in application, even in concentrated solutions.

Intestinal antisepsis, J. H. CRAWFORD (*Amer. Vet. Rev., 26 (1903), No. 11, pp. 1056–1058*).—A brief account is presented of the conditions under which toxic substances are developed in the intestines. Encouraging results were obtained by the author in administering an antiseptic mixture containing carbolic acid, boric acid, oil of gaultheria, fluid extract of capsicum, and alcohol.

Etiology and prevention of infectious diseases of animals, V. A. MOORE (*Amer. Vet. Rev., 26 (1903), No. 11, pp. 1030–1038*).—A general review of recent progress in the study and determination of the specific bacterial causes of infectious diseases and of the conditions which determine infection. Attention is called to the influence of certain external conditions on the health of the animals, as well as the virulence of the bacillus upon infection.

The pathology of infection, J. B. SANDERSON (*Amer. Vet. Rev., 26 (1903), No. 10, pp. 928–936*).—Attention is called to the recent advances made in microscopy, antisepsis, bacteriology, and in the study of toxins and the various bodies in the blood serum which are concerned with the production of immunity.

Bacteriology and pathological microscopy for veterinarians and veterinary stations, T. KITT (*Bacterienkunde und pathologische Mikroskopie für Thierärzte und Studierende der Thiermedicin. Vienna: Moritz Perles, 1903, 4. ed., pp. XI + 539, pls. 2, figs. 205*).—The present revised edition of the author's text-book on pathological bacteriology has been brought up to date, so far as possible, and is especially designed for the use of students of comparative pathology and veterinary bacteriology, and also as a guide and reference book for the use of practicing veterinarians. It contains a general account of the field of bacteriology, apparatus and technique, microscopic study of animal parasites (such as parasitic insects, mites, worms, and protozoa), and detailed studies of the various pathogenic bacteria.

Protozoa and disease, J. J. CLARKE (*London: Ballière, Tindall & Cox, 1903, pt. 1, pp. XIX + 177, figs. 91*).—The subjects considered in this volume include unicellular organisms and the cell, Sarcodina, Sporozoa, and the malaria parasites, Gregarinida, Coccidia and Hæmosporidia, Flagellata, Ciliata, and other groups of Protozoa, as well as a discussion of diseases to which Protozoa are subject, and methods used in studying these organisms. Detailed notes are given on the appearance and life history of various species of Protozoa parasitic in man, domesticated mammals, fish, insects, and other host animals.

Studies on Coccidium cuniculi, R. METZNER (*Arch. Protistenkunde, 2 (1903), No. 1, pp. 13–72, pl. 1*).—An elaborate account is presented of the microscopic anatomy and life history of this organism. The literature of the subject is discussed in connection with a bibliography. According to the author's investigations, the sporozöites of this organism possess a slender anterior end terminating in a sharp point, while the posterior end is more rounded and contains an ovate structure. Sporulation takes place under conditions favorable to the access of air. The pancreatic juice of rabbits and dogs sets the sporozöites free, while the gastric juice is without effect.

Plant disease and its relation to animal life, E. F. WRIGHT (*London: Swan, Sonnenschein & Co., Ltd., 1903, pp. 160*).—In this volume the author seeks to show the importance of iron in the health, growth, and development of both plants and animals. Attention is called to the relationship of iron to chlorophyll and hemoglobin, and the belief is expressed that the attacks of insects and infectious diseases upon plants as well as the existence of unfavorable soil conditions may lead to a diminished content of iron in plants. It is assumed that animals feeding upon such plants receive less iron than they require, and that consequently the hemoglobin becomes abnormal. It is argued that such animals are thereby rendered less resistant

to various diseases than they otherwise would be. These theories are discussed with illustrations and arguments upon the conditions observed in heartwater, South African horse sickness, flukeworms, tuberculosis, cancer, leprosy, etc.

Experiments on animals, S. PAGET (*London: John Murray, 1903, rev. ed., pp. XVI+387, pl. 1*).—The author's purpose in the preparation of this volume was to present a review of the important results in human and veterinary medicine which have been obtained through experiments on animals. This new edition includes, in addition to the old material, a special discussion of results which have recently been obtained in work on malaria, yellow fever, filariasis, tuberculosis, etc. In addition to the subject already mentioned the volume contains an account of experiments made on the blood, lacteals, gastric juice, glycogen, pancreas, growth of bone, nervous system, anthrax, septicemia, diphtheria, tetanus, rabies, cholera, plague, typhoid fever, action of drugs, snake venom, parasitic diseases, etc.

Report on the veterinary service for the year 1902, W. LITTLEWOOD (*Jour. Khediv. Agr. Soc. and School Agr., 5 (1903), No. 2, pp. 52–55*).—Brief notes on the various animal diseases which were observed during the year, and also on the vaccine institute, veterinary schools, abattoirs, and the importation of animals.

Report of the State veterinarian, D. F. LUCKEY (*Missouri State Bd. Agr. Rpt. 1902, pp. 29–34, 366–374*).—Brief notes on malignant catarrh in cattle, various hog and sheep diseases, blackleg, Texas fever, etc. A tabulated list is presented of the various cases of disease in animals visited by the author and his deputies.

The agreement between Austro-Hungary and Germany with regard to animal plagues (*Arch. Deut. Landw. Raths, 27 (1903), pp. 163–193*).—A copy of this agreement, which has been in force since December 6, 1891, is given. As a result of a discussion of this subject it was concluded that in the event of a future modification of commercial treaties between Germany and Austro-Hungary, no specification should be included regarding animal plagues, but that this matter should be left subject to the Animal Plague Law.

Suggestions regarding the modifications of the Animal Plague Law (*Arch. Deut. Landw. Raths, 27 (1903), pp. 227–397*).—A copy is given of the Animal Plague Law of Germany, passed June 23, 1880, and May 1, 1894. During an extended discussion of the features of this law a number of changes were suggested. It was recommended that unloading stations for animals be provided with impervious floors and that this recommendation should also be applied to markets and trading booths. It was also recommended that the compulsory notification of tuberculosis in animals should be required of laymen only in case of the presence of easily recognized clinical symptoms.

Human and bovine tuberculosis, E. NOCARD (*Rev. Gén. Méd. Vét., 1 (1903), No. 1, pp. 1–9*).—The author combats Koch's view of the nonidentity of these two forms of tuberculosis and presents arguments in support of the view that cattle are not refractory to human tuberculosis in general, but only to certain races of tubercle bacilli of human origin. The author believes that the disease is transmissible from man to animals and from animals to man, and urges that sanitary measures should still be maintained with regard to the control of tuberculous milk and meat.

Discussion of tuberculosis in children: Its relation to bovine tuberculosis, N. RAW (*British Med. Jour., 1903, No. 2226, pp. 470–474*).—A large number of cases of tuberculosis in children were critically investigated for the purpose of judging the evidence regarding the source of infection. As the result of these studies the author concludes that bovine tuberculosis is very virulent for children and is the cause of tabes mesenterica and other varieties of abdominal tuberculosis. The author inclines to accept the view that there are two forms of tuberculosis, both of which affect man, and believes that bovine tuberculosis is more virulent for children than the human form of the disease. The author's paper was discussed in detail by a number of

investigators, the majority of whom were of the opinion that tuberculosis may be transmitted from animals to man.

Tuberculosis of the dairy cow, S. STEWART (*Missouri State Bd. Agr. Rpt. 1902, pp. 268–271*).—A brief account of the symptoms of tuberculosis, prevalence of the disease in dairies, and dangers which arise from carelessness in handling tuberculous products.

Tuberculosis as a result of inoculation of animals with dead tubercle bacilli, N. PANOV (*Dissertation, Dorpat, 1902, pp. 131, pl. 1*).—An elaborate review of the literature of this subject is presented in connection with a bibliography. In the author's experiments tubercle bacilli from human patients were used, and the experimental animals were rabbits. As a result of inoculating rabbits with large quantities of dead tubercle bacilli of considerable virulence it was found that tubercles were produced in the lungs, liver, and other organs; that these formations were of short duration except in cases where the toxin was introduced in sufficient quantity to produce death.

The intermediary body of the tubercle bacillus, J. BORDET and O. GENGOU (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 5, pp. 351–353*).—In experiments conducted by these authors it was found that when guinea pigs were inoculated with living tubercle bacilli of human origin generalized tuberculosis results without the formation of an intermediary body. Negative results were uniformly obtained in testing the serum for this body. On the other hand, if guinea pigs are inoculated hypodermically 2 or 3 times with tubercle bacilli of avian origin, an intermediary body is produced in the blood of the experimental animals, and this body leads to the rapid absorption of the alexin of the blood by the bacillus.

The possibility of immunizing guinea pigs against tuberculosis, E. LEVY (*Centbl. Bakt. u. Par., 1. Abt., 33 (1903), No. 9, Orig., pp. 701–703*).—During the author's experiments, which have been prosecuted since 1888, it was found that an 80 per cent sterilized solution of glycerin was capable of destroying the virulence of tubercle bacilli within 48 hours, at a temperature of 37° C. Numerous experiments were made extending over several years, for the purpose of determining the effect of exposure to glycerin in solutions of different strength for different periods. A guinea pig was inoculated subcutaneously with an emulsion of tubercle bacilli which had been kept for 6 days in glycerin, and a similar injection was made by the intraperitoneal method in another guinea pig. After the animals had recovered completely they were inoculated with 5, 4, 3, and 2 day old cultures in succession. Finally the treated animals, together with 2 control guinea pigs, were inoculated with virulent tubercle bacilli. Abscesses were formed at the point of inoculation on the treated animals, but within a period of 4 weeks these abscesses healed entirely, while the tuberculous processes developed with fatal consequences in the 2 control guinea pigs. Both of the treated guinea pigs were killed and carefully examined without finding a trace of tuberculosis.

An experiment in the use of air and oxygen in checking the course of tuberculosis in tuberculin-reacting cattle, V. A. MOORE (*Amer. Vet. Rev., 27 (1903), No. 4, pp. 289–300*).—During the experiment reported in this paper 19 cattle were divided into 3 lots of 5, 7, and 7, respectively, the lot containing 5 being untreated, while the other 2 lots were inflated with air or oxygen in the abdominal and pleural cavities. All of the animals were affected with generalized tuberculosis in different degrees. A few fatalities resulted from the inflation of the pleural cavity.

In all cases the immediate effects of the inflation were an increased pulse and rate of respiration and occasionally a slight rise in temperature. During the first 3 months of treatment the animals which received oxygen thrived better than those in the other 2 lots. When the treated animals were killed and examined it was found that they were still affected with generalized tuberculosis, and inoculation experiments in guinea pigs with material obtained from the tubercles showed that the tubercle bacillus was still present in a virulent condition.

The animals which were inflated with air failed to react toward the end of the experiment and seemed to be benefited by the treatment more than those which received oxygen. The results obtained in these experiments, however, are not considered as sufficient for drawing general conclusions regarding the value of this method of treatment.

The fight against tuberculosis in the Australian Colonies and New Zealand, J. P. D. LEAHY (*Trans. and Proc. New Zealand Inst., 35 (1902), pp. 220-225*).—The usual means of distribution of tubercle bacilli are briefly mentioned and notes are given on the legislative and sanitary work which has been done in controlling this disease in the various Australian colonies and in New Zealand. The legislation with regard to meat and milk of tuberculous animals is considered as quite defective.

The etiology and treatment of tetanus, E. THIERRY (*Jour. Agr. Prat., n. ser., 6 (1903), No. 30, p. 127*).—Notes are given on the tetanus bacillus and on methods which have been tested in devising a cure for tetanus. In cases where the masticatory muscles are not affected the animal usually recovers, while the majority of cases in which these muscles are attacked ultimately die. Favorable results are obtained in some cases from the use of a chloral or belladona ointment applied to the muscles of mastication.

Two cases of tetanus, T. A. KRAGNESS (*Amer. Vet. Rev., 26 (1903), No. 11, pp. 1060-1062*).—The author reports success in treating 2 cases of tetanus without recourse to the serum method. Calomel and fluid extract of gelsemium were administered, followed by anodynes, enemas, and other symptomatic treatment.

Plague in domestic animals, J. CANTLIE (*British Med. Jour., 1903, No. 2230, pp. 715, 716*).—Attention is called to the fact that a considerable number of domestic animals are subject to plague and that the disease may exist in them for a considerable time without developing any pronounced symptoms. After infection turkeys may live 44 days, ducks 54, geese 35, sheep 34, and other animals may also resist the action of the disease for long periods. The prophylaxis of plague is therefore believed to be a more difficult matter than has been assumed, and will in the author's opinion remain so until a method has been devised for diagnosing plague in its early stages in the domestic animals.

A disease of cattle as seen in south-central Nebraska during 1899 and 1900, A. BOSTROM (*Amer. Vet. Rev., 27 (1903), No. 4, pp. 331, 332*).—A description is given of a disease which appears suddenly and affects about 10 per cent of the herd. A stiffness is noticed at first, combined with an appearance of lesions in the mouth, and sore eyes. The sucking calves of affected cows did not take the disease. The course of the disease is from 2 to 3 weeks, and the rate of mortality is about [illegible] per cent. The author is uncertain as to the nature of this disease, but believes it to be contagious.

Common ailments of breeding cattle, C. L. WILLOUGHBY (*Georgia Sta. Bul. 60, pp. 44, figs. 16*).—The purpose of this bulletin is to present in a popular and convenient form an account of the more important diseases to which cattle are subject, together with a discussion of the most efficient remedies. The subjects discussed include breeding, pregnancy, abortion, parturition, parturient paresis, uterine diseases, affections of the udder, bloating, and impaction.

An account is given of the causes of barrenness, and brief notes are presented on the more important farm medicines and the methods of administering them. In the treatment of parturient paresis success was had in 2 cases from the application of Schmidt's method. In a discussion of the various diseases many practical suggestions are made which can be readily utilized to good advantage by the farmer and dairyman.

Milk fever, abortion, diarrhea (*Jersey cattle, their feeding and management. London: Vinton & Co., Ltd., 1903, 2. ed., pp. 29-73*).—A detailed account is given of the symptoms and treatment of these diseases. A number of members of the English

Jersey Cattle Society have tried experiments in the treatment of cows before calving in order to prevent the development of milk fever. This preventive treatment, which has proved to be quite satisfactory, consists in giving special attention to the comfort, temperature conditions, etc., of cows for a period of 4 to 6 weeks before calving. During the latter part of this period it is considered desirable to take the temperature of cows daily, or oftener if any abnormal conditions appear.

It is recommended that some laxative feed be given, but that otherwise the feed should be somewhat reduced in order to prevent excessive development of internal fat. It is also recommended that cows be dried off at least 4 weeks before calving. In treating cases of milk fever success is reported from the application of drastic poultices to the spinal cord, ice about the head, and giving laxative drinks. Schmidt's treatment also proved successful.

Reports are given from various members of the society concerning the prevalence and treatment of abortion. Several members report success from the application of external antiseptic washes. Prevention is considered better than treatment, however, since treatment is not always uniform in results. The best method of prevention, in the experience of the members of the society, consists in giving attention to the hygienic conditions of the animal and the application of strict disinfectant measures in case of an outbreak of the disease.

The form of diarrhea which was investigated was found to be due to the presence of stomach worms. A number of experiments were made in testing the action of ammonia upon these worms. This substance was found to exercise a very rapid effect upon the worms. The parasites were killed within 3 minutes when placed in a solution containing 1 part ammonia to 2,400 parts of water, and in 90 minutes in a solution containing 1 part of ammonia to 30,000 parts of water.

Milk fever, J. W. CONNAWAY (*Missouri State Bd. Agr. Rpt., 1902, pp. 332–334*).—A short account of the prevention and treatment of this disease. It is recommended that cows be put on short rations for a week or so before calving. In treating the disease the Schmidt method is recommended, combined with the use of Epsom salts as a laxative.

Parturient paresis, A. W. BAKER (*Amer. Vet. Rev., 27 (1903), No. 3, p. 235*).—The author frequently has occasion to treat cases of this disease and has had best success from the administration of magnesium sulphate together with infusion of potassium iodid and creolin every 8 hours. If necessary this treatment may be followed by stimulants, such as nux vomica, belladonna, or aromatic spirits of ammonia.

Parturient paresis, D. R. KOHLER (*Amer. Vet. Rev., 26 (1903), No. 11, pp. 1053–1055*).—Notes on the cause, symptoms, course, and treatment of this disease. In the author's experience the best results were obtained in the administration of strychnin, Barbados aloes, nitrous ether, and aromatic spirits of ammonia followed by infusions of potassium iodid.

Preliminary report on a new method of preventing milk fever, A. S. WHEELER (*Amer. Vet. Rev., 27 (1903), No. 1, pp. 57, 58*).—An experiment was made on 30 cows in testing the method used by certain dairymen in England in the treatment of milk fever. The method consists in partially milking the cows every 6 hours after calving for the first 3 or 4 days. The purpose of this treatment is to partly relieve the pressure in the udder, but not to reduce it too quickly. None of the 30 cows developed milk fever, and this result is considered as highly satisfactory, since heretofore it has been impossible to avoid the occurrence of the disease. Further experiments will be made with this method.

The treatment of parturient paresis, J. B. CAUGHEY (*Amer. Vet. Rev., 26 (1903), No. 10, pp. 958, 959*).—Excellent results are reported from the use of potassium iodid in treating this disease. The author states, however, that where any drench is used unsatisfactory results are obtained in a large percentage of cases. The author is inclined to believe from his experience that considerable danger attaches to the use of magnesium sulphate as a drench in cases of parturient paresis.

Tricresol in the treatment of parturient paresis, S. Brenton (*Amer. Vet. Rev.*, *26* (*1903*), *No. 12*, *pp. 1124, 1125*).—The author has had good success in treating cases of this disease with a mixture containing 2 gm. of tricresol and glycerin in a quart of sterilized water. This mixture is injected in equal quantities into each quarter of the udder. In the majority of cases 1 injection is all that is required, but the treatment may be repeated at intervals of 6 to 8 hours if necessary.

Contagious vaginitis in cattle, E. Thierry (*Jour. Agr. Prat.*, *n. ser.*, *5* (*1903*), *No. 23*, *pp. 737–739*).—The symptoms and distribution of this disease are briefly noted and a short description is given of its various forms. Spontaneous recovery takes place in some cases after 4 to 5 weeks. Injections of permanganate of potash were effective in controlling the disease, but are considered rather difficult to apply. The simplest and most economic method of treating the disease is believed to be found in quarantining and retiring from service all infected bulls.

Hygienic conditions of parturition as a prevention of calf diseases, M. G. de Bruin (*Fortschr. Vet. Hyg.*, *1* (*1903*), *No. 6*, *pp. 181–186*).—The author briefly describes the natural provisions by which the calf is protected against infection during the process of parturition. In order to prevent infection of calves it is suggested that attention be given to the following matters: Promotion of a normal course of parturition, prevention of contact of the umbilical cord with soil or other substance, and rapid drying of the umbilical cord.

Blackleg and malignant edema, from the standpoint of differential diagnosis, G. Gutzeit (*Fortschr. Vet. Hyg.*, *1* (*1903*), *No. 5*, *pp. 157–159*).—Blackleg appears to be confined to certain districts which are permanently infected, while malignant edema may appear anywhere without relation to particular districts. The clinical symptoms of both diseases are very similar, but the pathological anatomy furnishes a surer basis for differential diagnosis. Conspicuous differences can also be demonstrated by cultivation of the pathological organisms. Finally, the surest method of differentiating between these diseases is found in inoculation of experimental animals. Rabbits and mice are not susceptible to blackleg, but readily become infected with malignant edema.

Psoroptic scabies in cattle (*Bul. Missouri State Bd. Agr.*, *3* (*1903*), *No. 5*, *pp. 12–16*, *figs. 2*).—Descriptive and biological notes on the mite which causes this disease and a short account of symptoms and treatment. The author recommends dipping in creolin, chloro-naphtholeum, or the lime and sulphur dip.

The cattle tick and its relation to the cattle industry of North Carolina, T. Butler (*Bul. North Carolina State Bd. Agr.*, *24* (*1903*), *No. 5*, *pp. 28*, *figs. 2*).—Notes are given on the appearance, habits, and life history of the cattle tick and on the losses due to its attacks upon cattle. In exterminating the tick it is recommended that cattle, horses, and mules be kept out of tick-infested pastures after September 1, that such pastures be divided by fences with a tight board along the ground so as to allow alternation of grazing. Where it is practicable it is also recommended that infested pastures be burned over.

Notes are also given on the Federal quarantine line, State quarantine line, and the hardships which cattle raisers of the State suffer on account of these restrictions. Attention is called to the fact that much better conditions for cattle raisers would exist if ticks were exterminated. Notes are also given on the immunization of cattle to Texas fever, and a brief account is presented of the symptoms of this disease.

Trichodectes geomydis expansus, and the ticks of Mexico, A. Dugès (*Mem. y Rev. Soc. Cient. "Antonio Alzate,"* *18* (*1902*), *No. 4–5*, *pp. 185–195*, *figs. 35*).—A description is given of *Trichodectes geomydis*, and notes are given on its life history. It lives as a parasite on *Geomys mexicanus*. Brief notes are also presented on *Amblyomma cajannense*, *Ornithodoros megnini*, *O. turicata*, and the common cattle tick.

Wasting diseases caused by animal parasites, W. A. Knight (*Amer. Vet. Rev.*, *27* (*1903*), *No. 6*, *pp. 522–525*).—The common lung and stomach worms of sheep and

cattle are *Strongylus filaria*, *S. micrurus*, and *S. contortus*. The animals upon which the author made his observations in Texas were also infested with *Uncinaria radia* and *Œsophagostoma columbianum*. These worms appeared to be so well protected against vermicide treatment that quite unsatisfactory results were obtained from the use of turpentine, chloroform, carbolic acid, benzine, creosote, liquid sulphur, and formalin. The post-mortem appearances of infested animals are briefly described. In preventing the spread of the disease the author recommends isolation of affected animals, drainage of pastures, and a pure water supply.

Dipping tanks, G. S. Armstrong (*Agr. Jour. and Min. Rec., 6 (1903), No. 15, pp. 566–568, fig. 1*).—Attention is called to the necessity of dipping cattle and to the use of certain dipping vats and chemicals. The author describes the details of construction of a dipping tank for cattle which has been found to give satisfaction in operation. The cost of the dipping tank will vary, according to the materials used, between \$350 and \$500.

Dipping tanks, G. D. Alexander (*Agr. Jour. and Min. Rec., 6 (1903), No. 14, pp. 519–524*).—A number of opinions were secured from various people who have had experience in dipping cattle as to the effectiveness of this process. It was found that cattle could be freed from ticks for a period of 3 or 4 weeks during the worst season as the result of one dipping. The dip which was used most extensively contained arsenic, soap, and Stockholm tar.

The loco and some other poisonous plants in Montana, J. W. Blankinship (*Montana Sta. Bul. 45, pp. 75–104, figs. 7*).—The conditions under which plant poisoning occurs in Montana are briefly outlined. The distribution of the loco plant is briefly described and notes are given on its symptoms. In combating this trouble it is recommended that lambs be prevented from grazing on loco areas until late in the season, when the plant becomes less palatable.

W. A. Tudor made an experiment in the extermination of loco. He employed 2 men for a period of about 1 month, during which they succeeded in digging up the loco plants on an area of 16 square miles. The plants were cut off just below the crown by means of a heavy hoe. Where this was properly done the loco plants did not sprout again and have not appeared during the present season.

Descriptive and biological notes are also given on lupine, water hemlock, death camas, larkspur, and wild parsnip (*Pteryxia thapsoides*). All of these plants are believed to cause greater or less loss of stock in Montana. Brief notes are also given on the effect of alkali upon stock. The author presents an analytical synopsis of symptoms for the determination of the cause of poisoning. A brief bibliography of poisonous plants is appended.

Plants injurious to stock, T. N. Willing (*Rpt. Dept. Agr. Northwest Territories, 1902, pp. 33–44, figs. 9*).—A number of plants have been found to be poisonous or have been suspected of causing the death of domesticated animals in the Northwest Territories. Notes are given on some of the more important species, including horsetail, larkspur, corn cockle, lupines, loco weeds, water hemlock, death camas, etc. The symptoms produced by eating these plants are briefly described.

Hog cholera, C. L. Willoughby (*Georgia Sta. Press Bul. 41, pp. 4*).—Notes are given on the nature, cause, means of distribution, symptoms, and treatment of this disease. Suggestions are also made regarding sanitary measures, disinfection, disposal of dead animals, preventive regulations, and the control of the disease by State laws.

Hog cholera, D. Hutcheon (*Agr. Jour. Cape Good Hope, 23 (1903), No. 2, pp. 134–137*).—Brief notes on the symptoms and post-mortem appearances observed in this disease.

Hog cholera, W. C. Quinnell (*Queensland Agr. Jour., 13 (1903), No. 2, p. 92, pls. 2*).—Notes on the symptoms and etiology of this disease, which is shown to be distinct from swine plague and swine erysipelas.

Lungworms in swine, C. F. DAWSON (*Mo. Bul. Florida Dept. Agr., 13 (1903), No. 82, pp. 66, 67*).—A study of an outbreak of a fatal disease in pigs revealed the fact that the disease was due to the presence of a lungworm, *Strongylus paradoxus*. The disease is locally known in Florida as thumps. Young animals are more susceptible than older ones. The symptoms vary according to the number of worms present. The method of treatment recommended by the author is that of fumigation with irritating substances for the purpose of causing the expulsion of the worms by coughing.

The etiology of heaves, W. L. WILLIAMS (*Amer. Vet. Rev., 26 (1903), No. 10, pp. 955–957*).—While veterinarians are generally agreed that musty clover and timothy hay, especially if cut very ripe, are the usual cause of this disease, the author calls attention to the fact that the animals recover when proper care is taken of the diet. The fact is cited that clover and timothy raised under a system of irrigation never cause heaves, even if these crops are allowed to become very ripe before cutting. The author believes that it is possible that heaves may be due to some parasitic organism which is developed upon the feed in the field under certain conditions.

Purpura hæmorrhagica, J. W. COOK (*Amer. Vet. Rev., 27 (1903), No. 3, pp. 209–212*).—In treating cases of this disease in the horse the author reports satisfactory results from making numerous deep incisions in the various swellings which appear during the progress of the disease. This remedy led to recovery in all except 1 case.

Cerebro-spinal meningitis, B. K. DOW (*Amer. Vet. Rev., 27 (1903), No. 6, pp. 515–521*).—A general account of the cause and treatment of this disease. Notes are given on the treatment of cases in the horse. Strychnin, ginger, and belladona were administered without noteworthy beneficial effects.

Biliary fever or malarial fever in the horse, A. THEILER (*Transvaal Agr. Jour., 1 (1903), No. 3, pp. 11–14*).—This disease has long been known in South Africa, and its name is due to certain of the most conspicuous symptoms. It resembles Texas fever in cattle and is not contagious. The disease occurs in a chronic and acute form. Notes are given on the differential diagnosis of this disease. One of the most conspicuous post-mortem appearances is a brownish-yellow discoloration of the muscle tissue. Recovery from one attack appears to confer immunity in the majority of cases.

Ulcerative enteritis in the horse, G. L. BUFFINGTON (*Amer. Vet. Rev., 27 (1903), No. 2, pp. 124–128*).—The author describes the symptoms of this disease and outlines the conditions under which it occurs. Ulcerative enteritis runs a course of from 1 to 3 days and is fatal in a large percentage of cases. When the form of the disease is not too acute some benefit is derived from the administration of gentian powder, subnitrate of bismuth, prepared chalk, potassium chlorate, and powdered ginger.

Some facts and theories regarding surra and ulcerative lymphangitis, C. NOCKOLDS (*Amer. Vet. Rev., 27 (1903), No. 2, pp. 129–131*).—In the Philippines surra appears to be a rainy weather disease and persists for from 4 to 6 weeks after the dry season begins. The disease still prevails greatly in the Philippines and is the cause of enormous losses in horses. Brief notes are given on the possible agency of insects in carrying the disease. Ulcerative lymphangitis is said to be on the increase. More cases occur during the wet season than during the dry season. This disease appears to be caused by an organism which gains entrance in wounds.

The tsetse-fly disease and other related diseases, C. SCHILLING (*Arch. Schiffs u. Tropen-Hyg., 7 (1903), No. 6, pp. 255–262*).—Notes on the nature and cause of various diseases of animals and man due to infection with species of Trypanosoma.

The action of human serum on the Trypanosoma of nagana, mal de caderas, and surra, A. LAVERAN (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 1, pp. 15–19*).—Human serum when injected into animals infected with nagana has already been shown by the author to be very effective in destroying the blood parasite.

Similar results have been obtained and are reported in this article in experiments with surra and mal de caderas. The action of human serum was shown to be very similar toward all 3 species of Trypanosoma. When 0.5 to 1 cc. of human serum is injected hypodermically into mice inoculated with nagana, the blood parasites disappear within 24 to 36 hours.

Nagana, surra, and mal de caderas as three distinct diseases, A. LAVERAN and F. MESNIL (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 25, pp. 1529–1532*).—Evidence is presented to show that these diseases are all distinct from one another. They are due to 3 distinct species of Trypanosoma, viz: *T. evansi*, *T. brucei*, and *T. equinum*. Animals immunized against 1 species of Trypanosoma were found not to be immune to the other species.

Glanders in camels, A. P. PATROVSKI (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), Nos. 6, pp. 613–667; 7, pp. 712–765, pls. 5*).—The author conducted an elaborate series of experiments and made numerous observations on the development of glanders in camels from natural infection and also from artificial inoculation. Material obtained from glanderous camels was inoculated by various methods into small experimental animals and also into cattle and horses. The disease was found to be identical in all these animals.

Notes are given on the symptoms and post-mortem findings in glanders in camels, and on experiments made for the purpose of developing a rapid method for diagnosing glanders in these animals. The inoculation of guinea pigs was found to be one of the more successful and rapid methods of diagnosis. The question of the agglutination of glanders bacilli was studied and it was found possible to produce this process by treatment with serum of diseased animals, but the method is not recommended as reliable in all cases.

Rabies or hydrophobia, H. F. PALMER (*Amer. Vet. Rev., 27 (1903), No. 4, pp. 328–330*).—Brief notes on the etiology and treatment of this disease.

Malignant enzootic anemia of kennel dogs due to infection with blood-consuming worms (Dochmius trigonacephalus), F. H. MILLER (*Amer. Vet. Rev., 27 (1903), No. 6, pp. 491–511, figs. 4*).—While distemper is the most important disease to which dogs are subject, a great loss is suffered from intestinal parasitic worms. Notes are given on the appearance and life history of *D. trigonacephalus*, which is parasitic in the small intestines of young dogs. This disease is, according to the author's experience, very prevalent in New York City and neighboring localities and has proved to be very difficult to treat. The disease is most frequent in young puppies up to 10 weeks of age, since up to that age the animals apparently have no resisting power to the disease.

The parasitic worm which causes this disease has been found almost as abundantly in kennels maintained under the best sanitary conditions as in filthy locations. The disease appears suddenly, and the chief symptoms are depression, loss of appetite, staring coat, weak pulse, subnormal temperature, and anemia. The pathological anatomy of this disease resembles closely that of *D. duodenalis* in man. The author believes that the dog is the only host of *D. trigonacephalus*. Little success was had in treating this disease. Experiments were made with thymol, male shield fern, creolin, and other antiseptic substances, but the results were not very satisfactory. For preventing infestation with this worm the author recommends that the kennel should be provided with concrete floors, which would thus be impervious to worms.

Diseases of poultry, F. H. ROBERTSON (*Jour. Dept. Agr. West Australia, 7 (1903), No. 5, pp. 357–362*).—An account is presented of the symptoms, cause, and treatment of apoplexy, bronchitis, bumble foot, chicken pox, chicken cholera, canker, roup, leg weakness, and other diseases to which chickens are susceptible. Various recommendations are also made regarding the general sanitary conditions which should prevail in poultry houses in order to prevent the spread of diseases.

AGRICULTURAL ENGINEERING.

Egyptian irrigation, C. T. JOHNSTON (*U. S. Dept. Agr., Office of Experiment Stations Bul. 130, pp. 100, pls. 24, figs. 9*).—This bulletin gives the results of observations made during the winter of 1901–2 of the irrigation works, practices, and administrative system of Egypt, discussed with reference to their applicability to American conditions.

An irrigation project, J. CREVAT (*Jour. Agr. Prat., n. ser., 5 (1903), Nos. 16, pp. 513–515; 17, pp. 532–535; 18, pp. 566–568; 20, pp. 635–638, figs. 5; 6 (1903), Nos. 32, pp. 185–187, fig. 1; 34, pp. 249–254, fig. 1*).—This article discusses the general features of a plan for irrigating the plain of Loyettes from the River Ain, with formulas and tables relating to velocity of flow in canals, capacity of canals, etc.

Irrigation works (*Nature [London], 68 (1903), No. 1765, pp. 404–406*).—Notes on recent reports on irrigation in India, South Africa, and elsewhere.

Irrigation on the Murray: Utilization of the swamp lands, A. J. PERKINS (*Jour. Agr. and Ind. South Australia, 6 (1903), Nos. 8, pp. 489–494, figs. 5; 9, pp. 532–536; 10, pp. 592–595; 11, pp. 659–664*).—The possibility and means of reclaiming the swamp lands along the Murray and the physical and chemical properties and fertilizer requirements of the reclaimed soils are discussed, special attention being given to the soluble salts present.

The relation of rainfall to run-off, G. W. RAFTER (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 80, pp. 104, figs. 23*).—This bulletin discusses the cause, measurement, variation, and distribution of rainfall; the measurement of run-off and the calculation of the results; evaporation as affecting run-off; the movement of ground water, and the relation of geological structure and forest growth to run-off.

The author claims that the cause of rainfall, beyond the cooling of the air below the dew point, is not well understood, and that it is uncertain whether rainfall is to any extent increasing. He holds that there is no general expression giving accurately the relation of rainfall to run-off, every stream being in effect a law unto itself. For convenience of discussion the rainfall and run-off records given in the bulletin are divided into storage, growing, and replenishing periods, and it is shown that a large percentage of the total water supply runs off during the storage period. It is claimed, however, that the run-off of streams has been generally overestimated. Evaporation is shown to be a very uniform element, the largest evaporation occurring in deforested catchment areas. A study of ground water is shown to be of importance in explaining the peculiarities of stream flow. Forests exert an important influence in increasing ground water flow, so that it may be said that the removal of forests notably decreases the minimum flow of the stream. From the evidence adduced it is uncertain whether forests in any way influence the quantity of rainfall.

California hydrography, J. B. LIPPINCOTT (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 81, pp. 488, figs. 4, map 1*).—This is "a summary of as much of the data concerning the water supply of California as is available from printed records and from observations of other engineers and investigations made by this Survey. . . . The discharge measurements include both low-water and flood records and are accompanied by useful precipitation data." Summaries of observations on evaporation at a number of places in Nevada and California are included in the bulletin.

Water conservation, H. G. MCKINNEY (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 12, pp. 429, 430*).—This article discusses the advantages and disadvantages of the construction of dams on an extended scale for the conservation of water in Natal.

Riparian rights and the necessity to declare and define the law with respect to natural water, W. DEACON (*Queensland Agr. Jour., 13 (1903), No. 3, pp. 130–133*).—A brief discussion of this question as applied to Queensland.

Rural hydraulics, V. NICCOLI (*Idraulica rurale. Firenze: G. Barbèra, 1902, pp. 337, figs. 70*).

Historic highways of America, A. B. HULBERT (*Cleveland, Ohio: Arthur H. Clark Co., 1903, vols. 4, pp. 213, pls. 4, maps 4; 5, pp. 205, pl. 1, maps 3; 6, pp. 207, pls. 2, map 1; 7, pp. 194, maps 2*).—Volume 4 deals with Braddock's road and three relative papers; volume 5, the old glade (Forbes's) road (Pennsylvania State road); volume 6, Boone's Wilderness road; and volume 7, portage paths, the keys of the continent. These historic highways are described and discussed in their relation to national development. For a notice of previous volumes of this series see E. S. R., 14, p. 928.

Proceedings of the National Good Roads Convention held at St. Louis, Mo., April 27 to 29, 1903 (*U. S. Dept. Agr., Office of Public Road Inquiries Bul. 26, pp. 80*).—This convention was largely attended, most of the States and Territories being represented. Among the papers and addresses included in the bulletin are The History and Purposes of the Good Roads Movement, by W. H. Moore; Our National Policy, by M. Dodge; Congress and the People, by A. C. Latimer; Improvement of Our Highways, by J. B. Killebrew; Good Roads and Civilization, by N. A. Miles; The Farmers' Right to Recognition, by R. H. Kern; The Relation of Roads to Schools, by R. H. Jesse; Remarks on Ways and Means, by J. Hogg; Factors in America's Progress, by S. Hill; The Road Problem, by W. J. Bryan; The Press and the Roads, by R. W. Wright; Good Roads and How to Get Them, by R. Stone; Pennsylvania's New Road Law, by W. L. Rhodes; Bitumen as a Road Material, by F. J. Warren; Road Laws, by M. R. Campbell; Practical Road Building under the State-aid Plan, by W. L. Dickinson; What the South Wants, by C. P. Lane; Earth Roads by the Missouri Method, by G. W. Waters; Self-help better than Government Aid, by L. Young; Education of the People on the Good Roads Question, by J. H. Brigham; The Iowa Idea of the Good Roads Problem, by A. B. Cummins; and Good Roads as an Element in National Greatness, by T. Roosevelt.

Seventh annual report of the commissioner of highways, Ontario, 1902, A. W. CAMPBELL (*Toronto: Ontario Dept. Public Works, 1903, pp. 152, pl. 1, figs. 37*).—This is a report on road and street improvement in Ontario during 1902, and contains articles dealing with the following subjects: The good roads movement in Ontario; county roads; various laws of the province affecting road making; township reports on progress in highway improvement; modern road making, including brief discussions of road surfacing, drainage, use of broken stone and gravel, dirt roads, repair of roads, use of graders, crushers, rollers, and scrapers, hauling and spreading road metal, location with reference to hills, tile and concrete culverts, highway bridges, and snow roads; and reports from various towns on methods and progress of road improvement. There are also given specifications for macadam streets, concrete sidewalks, concrete curb and gutter, and for testing Portland cement.

Road dragging (*Mo. Bul. Missouri State Bd. Agr., 3 (1903), No. 1, pp. 42, figs. 7*).—This bulletin discusses the method of road dragging proposed and successfully practiced by D. W. King, of Maitland, Mo. The construction and use of the road drag is thus described: "The drag is made by splitting a log, placing the two pieces about 30 in. apart (with the flat sides both facing in the same direction), and pinning them together. The lower edge of the front piece is protected with iron; an old wagon tire will do. The log should be 10 or 12 in. thick and about 10 ft. long. Fasten a chain or heavy wire a foot or 18 in. from each end by which to haul it. Hitch the team so the drag will move the dirt toward the center of the road. The hitch is next in importance to the time at which the dragging is done. The right time is just as the road dries after a rain or when it is thawed on top during the winter and spring, and it should be dragged every time."

The bulletin also contains articles on The Best Application of Our Road Laws, by G. W. Waters, and The General Interest of the United States Government in the Improvement of Public Roads, by W. R. Richardson.

A proposed agricultural vehicle of the Arabian type, MARÉCHAL (*Bul. Dir. Agr. et Com. [Tunis], 8 (1903), No. 28, pp. 312–339, figs. 12*).—A two-wheel cart is described in detail, with results of tests of draft on different kinds of roads and descriptions of harness to be used with the cart.

The utility of motor cars for the carriage of produce in country districts, J. T. BELL ET AL. (*Queensland Agr. Jour., 13 (1903), No. 2, pp. 110–121*).—A general discussion of the proposition to substitute motor freight cars for the so-called agricultural railways, which are claimed to have been unprofitable in Queensland.

Applications of electricity to agriculture, E. GUARINI (*Engineer. Mag. and Ind. Rev., 25 (1903), No. 4, pp. 550–561, figs. 9*).—The agricultural applications of electricity discussed in this article are measurement of rainfall and for storm warning (Lancetta's apparatus), telegraphy and telephony, operating plows, appliances for felling trees, thrashing machines, etc. An electrically operated farm at Crottorf, Saxony, is described, especial attention being given to the installation of the electrical apparatus. Figures are quoted to show that the cost of electric plowing has been reduced as low as $2 to $2.50 per acre. Two systems are employed—single motor and double motor.

Farm power, R. HOGGAN ET AL. (*Queensland Agr. Jour., 13 (1903), No. 2, pp. 123–130*).—A discussion of the adaptability of gasoline engines to farm work, with an account of the construction and operation of such engines.

Farm engines and how to run them, J. H. STEPHENSON (*Chicago: Frederick J. Drake & Co., 1903, pp. 215, pl. 1, figs. 63*).—"A simple, practical handbook, for experts as well as for amateurs, fully describing every part of an engine and boiler, giving full directions for the safe and economical management of both; also several hundred questions and answers often given in examinations for an engineer's license, and chapters on farm engine economy, with special attention to traction and gasoline farm engines, and a chapter on the science of successful thrashing."

The use of agricultural machinery in the United States, G. FISCHER (*Deut. Landw. Presse, 29 (1902), Nos. 101, pp. 813, 814, figs. 2; 102, pp. 821, 822, figs. 6; 30 (1903), Nos. 1, p. 4, fig. 1; 3, pp. 20, 21, fig. 1; 4, p. 26; 7, pp. 47, 48, fig. 1; 10, p. 74, figs. 6; 12, pp. 91, 92, figs. 11; 16, p. 127, figs. 5; 18, p. 148, figs. 2; 20, pp. 164, 165, figs. 6; 22, p. 184, figs. 7; 25, p. 211, figs. 2*).—The implements and machinery discussed include plows, harrows, fertilizer distributers, seeding machines, harvesting machines, thrashing machines, elevators, hay handling and loading apparatus, windmills, cold storage and drying rooms, road shovels, silos, machines used in maize culture, dairy apparatus and utensils, and apparatus for preserving and canning fruit.

Markets for agricultural implements and vehicles in foreign countries, (*Spec. [U. S.] Consular Rpts. 27, 1903, pp. XLVIII + 181, figs. 34*).—The questions considered in these reports are the cost of hand labor as related to labor-saving machinery; suitability of roads and draft animals in foreign countries to American vehicles; the extent to which agricultural implements, vehicles, etc., are used in the different countries; and the possibility and means of extending the trade in these articles.

MISCELLANEOUS.

Twelfth Annual Report of Oklahoma Station, 1903 (*Oklahoma Sta. Rpt. 1903, pp. 15–71*).—This includes a report of the director, a summary of the press bulletins issued during the year, meteorological data noted elsewhere, and a financial statement for the fiscal year ended June 30, 1903. The press bulletins, which are to a certain extent a repetition of matter contained in the regular bulletins of the station, deal with a variety of subjects, including the culture of wheat, oats, alfalfa, and peanuts, making lawns, testing seeds, comparative feeding value of cotton seed and cotton-seed meal, feeding experiments with steers and pigs, Texas fever, pink-eye, borers in trees, Hessian fly, body blight of pears, grapevine-leaf hopper, melon louse, striped cucum-

ber beetle, bagworms, chinch bug, planting seeds of forest trees, peach culture, and varieties of fruit for Oklahoma.

Thirteenth Annual Report of Wyoming Station, 1903 (*Wyoming Sta. Rpt. 1903, pp. 68*).—This includes the organization list of the station, a report of the director, a financial statement for the fiscal year ended June 30, 1903, and reports of members of the station staff, parts of which are noted elsewhere. The report of the director discusses, among other subjects, the origin and purpose of the station; cooperative work; station equipment and buildings, and lines of work that may profitably be undertaken by the station, especially in stock feeding and breeding; and includes abstracts of the regular bulletins issued during the year, and reprints of press bulletins dealing with storage reservoirs, food adulteration and inspection, the prevention of grain smut, and the Rhizoctonia disease of potatoes.

Index to Wyoming Station bulletins, GRACE R. HEBARD (*Wyoming Sta. Index Bul. C, pp. 33*).—A list of the publications of the station since its organization, and a subject index to Bulletins 38–53, issued from September, 1898, to June, 1902.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 5, Nos. 4, pp. 25–32; 5, pp. 33–40; 6, pp. 41–48*).—These numbers, for August, September, and October, 1903, contain the usual statistical information on the condition of crops in the United States and foreign countries.

Sources of the agricultural imports of the United States, 1898–1902, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 31, pp. 150*).—The total value of the agricultural imports during the fiscal year 1902 was $413,744,557 and the average value for the 5 years covered by this report was $379,124,315. Of the imports for 1902 Brazil supplied 15.07, the United Kingdom 8.74, Cuba 7.09, Japan 6.32, France 5.56, and Italy 5.19 per cent. The principal agricultural imports were coffee, animal fibers, hides and skins, sugar, vegetable fibers, fruits and nuts, alcoholic liquors, tobacco, tea, vegetable oils, and cocoa and chocolate. A similar statistical report for the years 1897–1901 was published as Bulletin 28 of the Section (E. S. R., 14, p. 508).

Distribution of the agricultural exports of the United States, 1898–1902, F. H. HITCHCOCK (*U. S. Dept. Agr., Division of Foreign Markets Bul. 32, pp. 224*).—The total value of the agricultural exports of the United States during the fiscal year 1902 was $857,113,533 and the average value for the 5 years covered by this report was $861,037,815. Of the agricultural exports during 1902 the United Kingdom received 48.62, Germany 15.39, the Netherlands 5.56, and France 5.34 per cent. Cotton constituted 34.02 per cent of the total agricultural exports, grain and grain products 24.9 per cent, and meat and meat products 22.85 per cent. A similar statistical report for the years 1897–1901 was published as Bulletin 29 of the Section (E. S. R., 14, p. 508).

Belgium's foreign trade in agricultural products for 1902 (*U. S. Dept. Agr., Division of Foreign Markets Circ. 26, pp. 8*).

Agricultural returns for Great Britain for 1902 (*London: Bd. Agr., 1903, pp. XL + 264, fig. 1, maps 2*).—A report on the agricultural returns relating to acreage and produce of crops and number of live stock in Great Britain, with summaries for the United Kingdom, British possessions, and foreign countries, and particulars of prices, imports, and exports of agricultural produce.

Letters on agriculture in the West Indies, Spain, and the Orient, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul 27, pp. 40, pls. 5*).—This contains the author's observations on agricultural conditions in the British West Indies, the Philippine Islands, Spain, China, the Persian Gulf region, and Japan. Comments are made especially upon the preparation being made in the British West Indies for the establishment of experiment stations and agricultural colleges, the culture of yams in Jamaica, the opportunities for agricultural and botanical research in the Philippine Islands, and breeds of milch cattle and carabaos for these islands. The author speaks very highly of the Jamaica yam, especially the variety Yampie.

Handbook for settlers (*Pretoria, Transvaal: Dept. Agr., 1902, pp. 96+XV, fig. 1*).—This publication, which is edited by A. R. E. Burton and designed to aid settlers in the Transvaal, contains descriptive and statistical matter regarding the country, discussions of the possibilities of various agricultural and live stock industries, and much miscellaneous information. A glossary of South African words, including many agricultural terms, is also given.

List of State directors of farmers' institutes and farmers' institute lecturers of the United States, J. HAMILTON (*U. S. Dept. Agr., Office of Experiment Stations Circ. 51, pp. 23*).

Bibliographia agronomica universalis, E. OTTAVI, A. MARESCALCHI ET AL. (*Casale: Ottavi Bros., 1903, No. 1, pp. 56*).—This is a list of 445 publications relating to agriculture which have appeared since January 1, 1903. The publications are for the most part in Italian, the intention being to include the foreign publications in the second number, soon to appear. The references are arranged alphabetically by authors under the following headings: General agriculture; soils, agricultural machinery, crops and their utilization; pests and diseases of cultivated plants; special crops; forestry; horticulture; zootechny; animal products; beneficial insects; hunting, fishing, pisciculture, and miscellaneous.

List of journals, with abbreviations used in the catalogue as references (*Internat. Cat. Sci. Lit., List of Journals, 1903, pp. XV+312*).—This contains lists of periodicals in different countries as prepared by the regional bureaus engaged in the preparation of the International Catalogue of Scientific Literature. Some 4,500 periodicals are listed. Instructions for the use of the regional bureaus are appended.

NOTES.

California Station.—A press report states that it has been decided to close the substation near Jackson, known as the Amador or Sierra Foothill Station. The station has been in existence for 6 years.

Georgia College.—Science Hall was completely destroyed by fire the night of November 19. The building was insured for $25,000 and some additional insurance was carried on the apparatus.

Iowa College.—W. W. Smith has been appointed to a fellowship in animal husbandry.

Missouri Station.—The Missouri Louisiana Purchase Commission has appropriated $7,000 to be given in prizes for Missouri corn. Each county is to hold a corn show, and the best corn from the several counties will be exhibited at St. Louis in December, where $1,000 will be distributed in prizes for corn. In connection with each county corn show a farmers' institute will be held, at which corn experts will give thorough instruction in breeding, growing, and harvesting corn. As a climax to this effort to interest Missouri farmers in better methods of corn growing, the College of Agriculture will give a ten-days' corn school. Important results are expected to follow these organized efforts.

South Carolina College and Station.—B. H. Rawl, B. S., has succeeded C. O. Upton in charge of dairy and animal husbandry work in the college and station, Professor Upton having resigned at the beginning of the college year, as previously noted.

Tennessee Station.—A new wing has been added to the dairy barn, which provides ample room for young calves, heifers, and dry cows. It is a three-story structure with stable below, storage for implements on the second floor, and seed room on the third floor. H. H. Hampton, a graduate of the university, has been appointed fertilizer chemist, the samples collected in the fertilizer inspection now being turned over to the station for analysis. The station has recently received several gifts of pure-bred cattle and hogs, and this winter will feed 32 head of beef cattle, 16 of which are grade Herefords from native cows. This is the first attempt the station has made to study the benefits from crossing the pure-bred Hereford sire on native stock. Under the appropriation made by the last legislature for farmers' institutes an endeavor is being made to hold an institute in every county in the State. These institutes are much appreciated, as is evidenced by the very large attendance.

Wyoming University and Station.—E. E. Slosson, chemist, has resigned to engage in literary work.

Plant and Animal Breeders' Association.—The call has been issued for a meeting of plant and animal breeders at St. Louis, December 29 and 30, 1903, with a view to organizing an association. The objects of the proposed association are to study the laws of heredity; to devise better methods of breeding plants and animals; to bring about cooperation in breeding, testing, and increasing the use of improved animals and plants; to better develop the work of registry associations and competitive shows of animals and plants, and, in general, to perfect the knowledge of breeding, and to aid in the better organization of the business of plant and animal breeding. It is proposed to divide into two sections—a plant section and an animal section.

The programme for the St. Louis meeting will provide general sessions for perfecting an organization and for the discussion of topics of interest alike to animal and plant breeders and biologists, and sessions of the two sections.

Agricultural Schools and Experimental Farms in Quebec.—A royal school has been incorporated under the laws of the Province of Quebec for the purpose of establishing and carrying on agricultural schools and experimental farms. The school is to maintain two or more schools and experimental farms in the province, one to be located in the district of Montreal and one in the district of Quebec. Each school will contain accommodations for at least 50 pupils and will give a 3-years' course, tuition and board being free of charge. The course will include all branches of agriculture, horticulture, aboriculture, dairying, slaughtering and curing of meats, carpentering, blacksmithing, and such other trades as may be useful to farmers. The school will establish experimental farms and "farms for tuition purposes," will clear and improve land and dispose of the same to its graduates and others, and will make advances to settlers to enable them to take up lands.

Primary Agricultural Schools in Saxony.—According to a recent issue of the Consular Reports there are 12 primary agricultural schools in Saxony and 2 horticultural schools. Candidates for admission to these schools must be at least 14 years of age, and no one will be considered who has not completed the prescribed course at some ordinary public school. The subjects taught in the primary agricultural school at Meissen, for example, include German, arithmetic, surveying, general agriculture, bookkeeping, writing, geometry, natural history, fruit raising, political economy, history, drawing, agricultural history, and stock raising.

New Correspondence Agricultural College.—A correspondence college for agriculture has been organized at Sioux City, Iowa, with the following professional staff: Director, Carl C. Magee, Sioux City, Iowa; dean of agricultural department, W. A. Linklater, Sioux City, Iowa; animal husbandry, W. J. Kennedy, of Iowa College of Agriculture and Mechanic Arts; agronomy, P. G. Holden, of the same institution; and veterinary science, A. T. Peters, of the Nebraska Experiment Station. The courses of study offered include animal husbandry, agronomy, veterinary science, stock feeding, stock judging, and short courses in castration, obstetrics, spaying, and sanitary and preventive medicine.

Miscellaneous.—According to a recent announcement a colonial school has been established in connection with the University of Nancy, France, in which instruction is given in forestry, agriculture, economics, etc., the object being to prepare students for positions in the French colonies. The number of students matriculated for 1902–3 was 34. In connection with this school biweekly conferences are held which are open to the public and have been quite largely attended. The director of the new school is Edmond Gain.

The commission appointed to inquire into the steps to be taken toward the establishment of a university for the Transvaal has recommended the acquisition of a site within a convenient distance of Johannesburg and Pretoria, upon which shall be located the teaching university, an agricultural school, and state laboratories for chemistry and animal and vegetable pathology. The appointment of a principal of the highest scientific attainments and approved organizing capacity is urged. Meanwhile H. S. Hele-Shaw, professor of engineering in Liverpool University, has been appointed to organize technical education in the Transvaal and the Orange River Colony.

Thomas Kosutány, director of the Chemical Experiment Station at Altenburg, Hungary, has been appointed director of the Chemical Agricultural Institute and Central Chemical Experiment Station at Budapest, and Josef Adorján has been appointed head chemist in the above institute.

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EXPERIMENT STATION RECORD.

VOL. XV. JANUARY, 1904. No. 5.

The meeting of the American Association for the Advancement of Science brought together at St. Louis, during the closing week of the year, nearly five hundred persons interested in various lines of scientific inquiry. Although the attendance was smaller than last year, it was a typical gathering of representatives of pure and applied science as related to the heavens above and the earth beneath and, it should be added, upon the earth, for agriculture was there, not in a single section or affiliated society, but in so many of the meetings as to be much in evidence. It had the unusual distinction, for it, of a prominent place in the presidential address, which was upon the subject of Scientific Investigation and Progress.

In considering what the world gains by scientific investigation, Dr. Remsen emphasized the importance of investigations relating to the problem of food supply. Referring to Berthelot's dream of the synthetic preparation of food from water and the carbonic acid of the air, he concluded that "although science is not likely, within periods that we may venture to think of, to do away with the necessity of cultivating the soil, it is likely to teach us how to get more out of the soil than we now do, and thus put us in a position to provide for the generations that are to follow us. And this carries with it the thought that unless scientific investigation is kept up these coming generations will not be provided for."

That there is to be no abatement of this investigation was indicated by the inauguration of two new societies whose fields are distinctly agricultural, and by the programmes of the Society for the Promotion of Agricultural Science and the Association of Economic Entomologists, as well as several sections of the association proper. The American Breeders' Association, as it was finally decided to call the new organization for plant and animal breeders, effected an organization of which the Honorable Secretary of Agriculture was chosen president, which provides for two sections, for plant breeding and animal breeding, respectively. An interesting programme of papers and discussions, relating for the most part to plant breeding, was

presented; and the Society for Horticultural Science formed at Boston last summer carried out a quite lengthy programme.

The initial meetings of these organizations developed an enthusiasm for earnest work which promises to make them useful factors in promoting investigation and advancement along their respective lines. They also increased the general confusion and conflict of programmes which has been evident in the past, and made it increasingly difficult to follow up the papers in a particular line. This became so apparent that joint sessions of several of the associations were held to listen to papers covering common ground.

A brief account of the papers relating to agricultural science which were presented at the St. Louis meeting will be given in the next issue.

The attention which the subject of rural economics received is worthy of special mention, in view of the increasing interest on the part of associations of various sorts in matters pertaining to agriculture and rural life. This is an encouraging indication of the impress being made in directing popular attention to agricultural education and investigation, and the improvement of farm life.

One session of the section on Social and Economic Science was given up to the economic aspects of agriculture. Four papers were read. In the first, on The Function of Forestry in the New Agriculture, T. H. Sherrard called attention to the fact that from one-third to one-half of the forests of the United States belong to farmers, and that their interest in forestry is primarily concerned with the maintenance of wood lots in a productive condition. The method of cooperation which the Bureau of Forestry carries on with farmers in managing forest areas was outlined, and a brief account given of the science of sylviculture as related to farming.

C. F. Curtiss, of Iowa, discussed The Economic Functions of Live Stock, pointing out the relationship between live stock and the maintenance of fertility of the soil, and urging the advantages to the soil and from a business standpoint of combining crop growing and animal production. Animal by-products, which were at first used solely as fertilizers, have nearly all been found to be valuable feeding stuffs for farm animals. They are now first fed to animals and later returned to the soil as manure. The speaker expressed the hope that when diversified farming and animal industry are properly combined the use of artificial fertilizers may become unnecessary.

Agricultural Economics was the subject of a paper by H. C. Taylor of Wisconsin, which was treated from the standpoint of instruction and of agricultural practice. The chief problem in agriculture is how to secure the largest net return from the land. The productive efficiency of the farmer was stated to vary as greatly as the fertility of the soil, and it was urged that theoretically the degree of efficiency of the

farming should be regulated to the productivity of the land. The lack of such an equilibrium was held to be responsible for the dissatisfaction of the farmer and the attempt to better his condition by making a change. This was thought to be reflected in a general way in the ownership of land. It was shown from the statistics compiled by the recent census that the percentage of land-owning farmers has been on a decline for the last twenty years. The causes for this decline apparently vary in different localities. In some cases the great advance in the price of land has brought about an increase in the tenant system, while in other localities the loss of productivity of the soil has necessitated the combination of farms into larger areas under the ownership of fewer individuals, with tenants. Land is often retained for sentimental reasons long after it has become so infertile as to render other occupations necessary for the support of the family. The showing of decline in land ownership caused surprise and led to considerable discussion of the causes and effects.

In a paper on Improvement in Farm Management, W. M. Hays, of Minnesota, urged the desirability of improving the social and educational conditions of farmers, in order to make their living conditions more pleasant and to retain the most active and progressive boys upon the farm. Attention was called to the various factors operating for the development of scientific agriculture and increasing farm production, and thus making the business of farming more attractive from a financial standpoint. The problem of arranging a rotation of crops and making combinations of profitable crops was discussed in considerable detail. The methods followed at the Minnesota Agricultural College in teaching farm management were described, in which the students are required to prepare plans for the laying out and management of their home farms, with the proposed crops for a period of ten years in advance. The preparation of these plans in a definite form necessitates a careful consideration of all the practical problems of farm management, as applied especially to each individual's farm. The adoption of a definite system of farm management, with a simple system of bookkeeping, it was urged would enable farmers to estimate accurately the profits derived from various lines of work, and to abandon the production of unprofitable crops.

The discussion which followed the presentation of these papers evidenced the interest which they aroused in the economic and sentimental features of agriculture and the conditions of rural life. It was agreed that the practical solution of the problems concerned in maintaining a large percentage of farming population and in securing the greatest net returns from the farm is to be accomplished along educational lines.

Ever since the discovery by Priestley and Cavendish in 1785 that the nitrogen and oxygen of the air can be made to combine under the

influence of the electric spark, the question of preparing nitrogenous compounds from the free nitrogen of the air has engaged the attention of scientific men from time to time. It is only within comparatively recent years, however, that the great industrial importance of utilizing this vast store of nitrogen has been fully realized, and serious attempts made to develop practical processes of rendering it available for commercial purposes.

The matter is highly important from an agricultural standpoint, for, as every one knows, nitrogen is the most expensive of the fertilizing constituents and is restricted in supply. The exhaustion of the nitrate deposits which constitute so prominent a source of supply has been placed by reliable estimates at a matter of only a generation or so distant. The air contains nitrogen enough for all, and it has seemed highly probable that ultimately a way would be found for utilizing it for other plants than legumes.

Siemens and Lovejoy and Bradley have made important advances in this direction by the use of high power electric currents for producing nitric acid from the nitrogen of the air. The development in 1894 by Moissan and Willson of an efficient electrical method for preparing calcium carbid has done much to insure the success of a very different process of fixing the free nitrogen of the air, namely, in the form of cyanamids of the alkaline earths. The recent work of Frank and Caro, Pfleger, Erlwein, Rothe, and others in the development of this method gives reasonable ground for hope that the problem of the manufacture of nitrogenous compounds from the nitrogen of the air in a practical way has to a large extent been solved.

The investigations of these men, which have been briefly reviewed in the *Record*, show that by fusion of the carbids of the alkaline earths, especially calcium carbid, in the presence of atmospheric nitrogen freed from the larger part of the associated oxygen, calcium cyanamid is produced. In practice it is found best to combine the preparation of the calcium carbid and of the cyanamid into a single operation, by starting with a mixture of calcium carbonate and coal (as in the making of carbid) and fusing these in the presence of the deoxygenized air. The crude product formed has admixed with it more or less lime and carbon, and contains from 10 to 22 per cent of nitrogen. By further treatment this product can be made to yield free ammonia, cyanid, or a dicyanamid containing 66 per cent of nitrogen, and other compounds. The experiments of Gerlach and Wagner, however, indicate this to be unnecessary from an agricultural standpoint, since the cyanamid can be used directly as a fertilizer. It has no injurious effects on plants, and shows an efficiency fully equal to, if not exceeding, that of the ammonium salts, and but slightly inferior to that of nitrate of soda.

The preparation of the calcium cyanamid is comparatively simple and cheap. A company has been organized in Berlin for the manufacture of nitrogenous compounds by this process, and if further experience fulfills the promise of the earlier work, it seems quite probable that this new source of nitrogen for fertilizing purposes will soon find its way into the markets, and the experiment stations will be called upon to definitely determine its agricultural value.

It is worthy of note that Dr. Remsen, in his presidential address before the Association for the Advancement of Science at St. Louis last month, referred at considerable length to this new discovery in its relation to the nitrogen supply of farm crops, and pronounced it to be "full of promise."

The list of grants made by the Carnegie Institution for research during the past year affords little ground for congratulation to those interested in the promotion of agricultural science. The great field of agriculture has no representation in this list, and the grants made to the related sciences are, from the nature of the subjects to be investigated, of only remote and indefinite application to agriculture.

In all fifty-five separate grants were made, aggregating $147,670, and in addition the sum of $25,000 was set aside for research assistants. Of these grants botany, zoology, and physiology received a total of $41,200, and the physical sciences over $64,000, while engineering received $8,620, anthropology and exploration $6,500 each, psychology $3,600, history $2,000, and bibliography $15,000.

These grants were mainly for research in the domain of theoretical and pure science, rather than for investigations bearing directly on any phase of science as applied to the arts and industries. This is true of the investigations provided for in the biological sciences, as well as in chemistry, astronomy, geology, etc. In botany, for example, the work authorized is mainly systematic and cytological, and for the maintenance of the desert botanical laboratory at Tucson, Arizona; and the two grants under physiology are for researches in connection with human nutrition. Zoology received the largest number of grants among the biological sciences, aggregating $18,000, none of which was for economic work. Among the principal topics in zoology are a study of recent and fossil corals, the blind fishes of Cuba, a monograph on American mosquitoes, investigations in experimental embryology, morphology and classification of deep sea sponges, and $11,000 for the maintenance of twenty tables at the Marine Biological Laboratory at Woods Hole and two at Naples.

The foundation of the composite science of agriculture is so wide that in a broad sense nearly all progress of general knowledge in the natural sciences may ultimately contribute toward the advancement of

agricultural science. But there is such need for fundamental researches on scientific problems immediately related to agriculture, and there are at present so few agencies through which this higher research can be carried on, that it was hoped some of the funds of the Carnegie Institution might be turned in that direction. Such researches are for the most part beyond the means of the individual experiment stations, whose very work has developed the need for them and has brought us to a point in the development of agricultural science where they are well-nigh indispensable to progress. This is true in the nutrition of farm animals, for example, the biology of the soil, the improvement and the nutrition of agricultural plants, the complex operations of cheese making and ripening, and a score of other subjects which are too large and too far-reaching for an experiment station to undertake single handed. In this field especially would the problems seem to be so broad and fundamental in their character, and so far-reaching in their relations to human life, as to "show the application of knowledge to the improvement of mankind."

It would appear that the workers in agricultural science have been very modest in their requests for aid, as the list of applications received up to the close of October, 1903, shows only four under the head of agriculture; three of the applicants did not state the amount desired, and the fourth named $5,000. A larger number of definite topics for investigation would have made the need of aid more evident and imperative, and impressed the claims of agriculture more forcibly upon the attention of the authorities of the institution.

The largest number of applications for grants were in zoology (109), chemistry (89), botany (60), and astronomy and physics (58 each). The total amount of the 142 applications received aggregates $2,200,398, which far exceeds the present income of the institution. The recommendations of the advisory committee carried an additional $900,000 per annum, $400,000 of which was for physics and geophysics, $230,000 for astronomy (with a plan for $2,000,000, extending over twelve or fourteen years), and $120,000 for explorations.

While the report of the institution for the past year may perhaps be taken as an indication of its tendencies, the aggregate amount of these grants and recommendations ($3,111,898) clearly shows that the Carnegie Institution will not be able to cover the ground of general science, let alone the special field of science as applied to agriculture. This emphasizes the great need of special provision for research in agriculture, in a form which will insure to the workers a large measure of freedom from distracting influences and from direct responsibility to a popular constituency.

CONVENTION OF ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, 1903.

H. W. LAWSON,
Office of Experiment Stations.

The twentieth annual convention of the Association of Official Agricultural Chemists was held at the Columbian University, Washington, D. C., November 19–21, 1903, the president of the association, R. J. Davidson, presiding. In his opening address the president called attention to the desirability of uniform fertilizer laws and proper standards for use in inspection work. An examination of the fertilizer laws of 23 States showed no mutual agreement as regards requirements or the form of statement of composition of fertilizers. The association was urged to exert its influence in bringing about a conformity of fertilizer laws to some definite standard, and having plain, simple, and intelligent statements made regarding fertilizer constituents. The limit of error or deficiency allowable in the percentage composition of fertilizers was considered, and attention was called anew to the resolution adopted by the association in 1900 recommending that the form of nitrogen in fertilizers be determined and reported upon. The speaker commended to the consideration of the association the matter of a uniform method of stating the results of investigations, a change in the temperature used for the graduation of measuring apparatus, and the republishing of Battle and Dancy's chemical conversion tables; and urged the importance of a more hearty cooperation by members of the association in the testing of methods.

The latter point was also emphasized in a brief address by H. W. Wiley, bearing on the needs of the association. The matter of republishing the conversion tables was referred to a committee consisting of H. B. McDonnell, C. B. Williams, and B. B. Ross, with directions to report upon this subject to the secretary of the association.

Hon. James Wilson, Secretary of Agriculture, and Dr. Charles W. Needham, president of Columbian University, were present upon invitation, and addressed the association. Secretary Wilson characterized the work of the association as of great value to the country, and spoke briefly of the progress being made in the execution of the law regarding the importation of food products, declaring that we have

come to the conclusion in this country that food products not good enough for the people in the countries in which they are produced are not good enough for us. The enforcement of the law was reported as being heartily welcomed by American merchants. The establishment by the Federal Government of interstate pure food laws was considered desirable.

The total attendance at the convention exceeded that in previous years. Nevertheless, toward the close, when final action was taken upon the more important matters, such as the adoption of methods, the actual attendance was quite small. Reports were received from all of the referees and from many of the associate referees, and several papers were read. These and the action of the association are referred to in the following summary under appropriate headings.

PHOSPHORIC ACID.

The referee on this subject, B. H. Hite, reported that no cooperative work was undertaken by him during the year, but that attention had been paid in his laboratory to certain modifications of well-known methods, involving the weighing of the yellow precipitate, a report upon which was considered inadvisable at the present time. The report of the associate referee dealt with comparative tests of the gravimetric and volumetric methods for the determination of total phosphoric acid in soils. The determination of phosphoric acid in different classes of phosphates was discussed by several members of the association.

In a communication from E. W. Hilgard, attention was called to the desirability of a better method for the valuation of basic phosphatic slags, and on account of the growing commercial importance of this class of fertilizers the association was urged to take up again the consideration of this question. The referee for next year was accordingly instructed to reconsider this question, with special regard to the establishment of a standard for total phosphoric acid and degree of fineness. Further study of Redonda and precipitated phosphates was also recommended. A paper on the determination of phosphorus in organic materials was presented in this connection.

Report of associate referee, C. B. Williams.—The volumetric and gravimetric methods for the determination of total phosphoric acid in soils were compared by the associate referee and two other analysts. The average results by the gravimetric method were higher than by the volumetric method. The volumetric method was believed to be preferable to the gravimetric method, and was recommended for adoption as an optional method for the determination of total phosphoric acid in soils. Further study of different solvents for phosphoric acid in soils was also recommended.

The determination of organic and inorganic phosphorus in vegetable and animal materials, E. B. Hart and W. H. Andrews.—The work reported was directed mainly to the elaboration of a method for the determination of inorganic

phosphorus. Uniform results for total phosphorus were obtained by the magnesium nitrate and Neumann methods.

The method finally adopted as giving best results in the determination of inorganic phosphorus consisted in extracting 5 gm. of the sample with 125 cc. of 0.2 per cent hydrochloric acid, the mixture being shaken vigorously for 15 minutes, decanting through a filter paper, and washing the residue with water until 500 cc. of filtrate was obtained; neutralizing 200 cc. of the filtrate with ammonia, using litmus as an indicator; adding 10 gm. of ammonium nitrate; warming the solution to 65° C., and adding 2 cc. of nitric acid and 25 cc. of neutral ammonium molybdate, the solution being kept at 65° for 15 minutes and filtered after 1 hour. After ignition and purification by dissolving in dilute nitric acid the phosphorus was weighed as magnesium pyrophosphate.

This article has also appeared in Bulletin 238 of the New York State Station, and an abstract setting forth more fully the results obtained by the use of these methods is given on page 496.

DETERMINATION OF NITROGEN.

The referee reported further tests of methods for determining available organic nitrogen in fertilizers. A change in the neutral permanganate method providing for the use of 2 gm. of material in the case of mixed fertilizers, and as heretofore an amount containing approximately 0.075 gm. of nitrogen in concentrated goods was approved. Further study of methods for available nitrogen was recommended. A paper on the electrolytic reduction of nitrates was read.

Report of referee, F. W. Morse.—Eight laboratories cooperated in testing modifications of the alkaline permanganate method in comparison with the neutral permanganate method for determining available organic nitrogen as used last year. Preliminary work with the alkaline permanganate method showed the necessity of a fixed amount of distillate and the probable advantage of a larger volume of solution. Samples of dried blood and cotton-seed meal were sent out with the request for tests of 3 modifications of the permanganate method.

Nine analysts reported on total nitrogen and 8 on the methods for available nitrogen. The determinations of total nitrogen agreed closely. The percentages of total nitrogen recovered from blood as available were 86.5 by the neutral method, 63.4 by the alkaline method as given in the report of the referee last year, and 69.4 by the alkaline method modified by the use of 150 cc. of the alkaline permanganate solution and distilling off 100 cc. The corresponding percentages in the case of cotton-seed meal were, respectively, 91.6, 46.1, and 58.1.

The referee recommended that in the neutral method a 300 cc. low-form Griffin beaker be used and that 2 gm. of material be taken if the sample is a mixed fertilizer, and also that the study of methods for the determination of available organic nitrogen be continued.

The electrolytic reduction of nitrogen in metallic nitrates, S. H. Sheib.—The electrolytic reduction of nitrates to ammonia, as described by Easton (see p. 444), was tried by Sheib on chemically pure and commercial sodium nitrate and on potassium nitrate with results stated by him to be far from satisfactory

SEPARATION OF NITROGENOUS BODIES.

The referee, L. L. Van Slyke, reported investigations on the separation of nitrogenous bodies in milk and cheese, giving methods for

the estimation of casein monolactate and casein dilactate which were adopted provisionally by the association. The report of R. Harcourt, associate referee on vegetable proteids, was not ready for presentation, but by vote of the association will be included in the proceedings. It was announced that this report would consist largely of compiled matter. W. D. Bigelow, as associate referee on meat proteids, called attention to the comparisons made by H. S. Grindley of the amounts of proteids in the water extracts of raw and cooked meats precipitated by various reagents, and reported investigations made by himself and F. C. Cook during the year.

In the examination of meat proteids the association recommended that further trial be made of phosphotungstic acid alone in hot and cold solutions, phosphotungstic acid followed by bromin, phosphotungstic acid followed by zinc sulphate, and tannin and salt followed by zinc sulphate; and that precipitation by bromin alone and by bromin in the filtrate from zinc sulphate be discontinued. The work by Dr. Grindley is noted below, as is also a paper on the determination of gliadin and glutenin which was presented in this connection.

Report of referee on milk and cheese proteids, L. L. Van Slyke.—A preliminary report was made upon a study of the official method for the determination of casein in milk, explanations being offered for some of the reactions met with in the use of that method. It was believed that the official method could be improved, and the referee announced that the results of the completed investigation along this line would be ready for presentation another year.

A study was made of the relation of casein monolactate and casein dilactate to the Hess and Doolittle method of detecting process or renovated butter. It was pointed out that the characteristics of the curd upon which this test is based depend upon the presence of one or the other of these compounds, and furthermore, that these compounds are dependent upon the amount of acid produced in the ripening of the cream. It was found possible to make genuine butter which would respond to the Hess and Doolittle test for process butter or vice versa, and also that different reactions could be obtained with butter when fresh and when several weeks old. It was believed, therefore, that the test must be regarded as worthless.

The methods devised by the referee and E. B. Hart for the separation and estimation of casein, casein monolactate, and casein dilactate in milk are given below in the form presented: (1) *Determination of casein monolactate in milk.* Casein monolactate in milk coagulates readily at 40° C. Hence, in a milk containing only casein and casein monolactate, the monolactate can be separated by heating the milk to about 40° C., filtering the precipitate formed, washing, and determining the nitrogen in the precipitate. Ten gm. of milk diluted with 90 cc. of water give good results. (2) *Separation of casein monolactate and casein dilactate.* Casein dilactate coagulates completely at 40° C. and below. In milk containing casein mono- and dilactates, we heat 10 gm. of milk diluted with 90 cc. of water to 40° C., and these two salts precipitate and are separated from the milk casein by filtration. The washed precipitate is then treated with 100 cc. of a 5 per cent solution of sodium chlorid and the whole heated to 55° C. with frequent agitation for 2 hours. The process is facilitated somewhat by the presence of pure quartz sand. The casein monolactate goes into solution and is separated from the casein dilactate by filtration and washing. (3) *Separation and determination of casein, casein monolactate, and casein dilactate in milk.* (a) The total amount of nitrogen precipitated by acid is determined by the official method

prescribed for determining casein in milk. (b) We heat 10 gm. of milk diluted with 90 cc. of water to 40° C. for 15 or 20 minutes, filter the precipitate formed, and wash with distilled water. The precipitate is then transferred to a small Erlenmeyer flask, provided with a stopper, treated with 100 cc. of a 5 per cent solution of sodium chlorid, and heated at 55° C. for 2 hours, with frequent agitation. The mixture is then filtered, the remaining precipitate washed with water, and the nitrogen determined in both the precipitate and filtrate. The nitrogen in the precipitate represents casein dilactate; that in the filtrate, casein monolactate. The sum of these two, subtracted from the total nitrogen found by precipitation with acid, gives the amount of nitrogen as casein.

Report of associate referee on meat proteids, W. D. BIGELOW.—Data are given for the earlier work of the associate referee and R. Harcourt, heretofore published only in part, and studies made during the year by the associate referee and F. C. Cook are reported. Solutions were made of commercial products, including meat extracts, beef juice, digested meat powder, and commercial peptones, and aliquot portions were subjected to the action of bromin, zinc sulphate, phosphotungstic acid, and tannin and salt. The filtrates from the precipitates obtained by the last three reagents were divided into aliquot parts and treated with the four reagents mentioned in different combinations. The amount of nitrogen precipitated by phosphotungstic acid was greater than that precipitated by any other single reagent, except in the products containing large amounts of peptones. The use of bromin alone was again shown to be unreliable.

The highest results from reagents in combinations were obtained from the tannin-salt reagent followed by zinc sulphate in the case of the filtrate from zinc sulphate. A marked influence was apparently exerted by the order in which the various reagents were employed. While tannin and salt followed by zinc sulphate gave the highest results, zinc sulphate followed by tannin and salt gave the lowest results. The author cautioned against drawing conclusions from the data which were presented merely as preliminary. A further study of the combinations of various reagents was deemed advisable.

A study of the nitrogenous constituents of meats, H. S. GRINDLEY.—Cold water extracts of raw and cooked meats were examined by methods which were described in detail. The different determinations expressed in percentages of the weight of original substance and in percentages of the total nitrogen soluble in water were given.

Eight samples of raw meats, 6 of boiled, and 6 of broiled or roasted meats were examined. In the case of the raw meats the average percentages of total nitrogen soluble in cold water by the different methods of analysis were as follows: (1) Coagulated by heat, 45.51; (2) precipitated by zinc sulphate, 4.18; (3) precipitated by bromin in filtrate from zinc sulphate, 1.31; (4) proteid nitrogen, 50.99; (5) non-proteid nitrogen, 49.01; (6) precipitated by bromin directly, 39.45; (7) precipitated by phosphotungstic acid in hot solution, 42.95; (8) precipitated by tannin and salt, 48.80; (9) precipitated by phosphotungstic acid in cold solution, 49.17; (10) as free ammonia, 2.86. In the case of boiled meats the average percentages were as follows: (1) 3.24, (2) 15.15, (3) 5.42, (4) 23.79, (5) 76.21, (6) 11.97, (7) 10.21, (8) 22.71, (9) 26.79, (10) 6.16. The averages for all determinations were (1) 22.23, (2) 8.09, (3) 2.85, (4) 33.16, (5) 66.84, (6) 23.50, (7) 24.73, (8) 30.87, (9) 32.05, (10) 3.69 per cent.

It was stated that while in general the triplicate determinations upon each sample agreed fairly well, the results obtained by different methods upon different samples varied greatly. The author considered it desirable to determine directly the amount of coagulable proteids contained in water extracts of meats and announced that further studies were being made upon this subject. Precipitation by bromin was found unsatisfactory and precipitation by phosphotungstic acid gave but slightly higher results.

Determination of gliadin and glutenin in flour by the Fleurent-Manget method, J. S. CHAMBERLAIN.—This method was believed to give too high results for gliadin, and, consequently, too low results for glutenin. Based upon the results of his study, which were reported in detail, the author gave a method for the determination of the proteids of flour, which is in substance as follows:

(1) Moisture is determined at 105° C. in an atmosphere of hydrogen or coal gas. (2) All determinations are made upon air-dry flour, either standard milled, or capable of passing through bolting cloth 90 to 100 meshes to the inch. (3) Four to six grams of the flour is placed in a 150 or 200 cc. flask and exactly 100 cc. of a 5 per cent solution of potassium sulphate is introduced. The mixture is shaken frequently for 18 to 24 hours, or placed in a shaker for 6 hours. After settling, 50 cc. is filtered off and the nitrogen determined in this by the Kjeldahl method. The nitrogen multiplied by 2 gives the nitrogen in the original sample. The nitrogen in the flour multiplied by 5.68 gives the proteids in the flour soluble in the dilute salt solution. (4) Two to four grams of flour is extracted in a similar manner with 100 cc. of 70 per cent alcohol, a digestion flask being used. The liquid is filtered off and the residue washed several times into the filter paper and the whole thoroughly washed with alcohol. The filtrate is acidified with sulphuric acid and evaporated almost to dryness when the nitrogen is determined. The nitrogen multiplied by 5.68 gives the proteids soluble in 70 per cent alcohol. (5) Nitrogen is determined in the residue (including filter paper) from the alcohol extraction, which, multiplied by 5.68, gives the proteids insoluble in 70 per cent alcohol. (6) The residue from a second alcohol extraction is extracted with 5 per cent sulphuric acid solution, as described above, and the nitrogen determined. The nitrogen multiplied by 5.68 gives the proteids in the residue from alcohol extraction soluble in the dilute salt solution. (7) The difference between the proteids obtained in (6) and (5) is glutenin. The difference between the proteids obtained in (3) and (6) subtracted from the proteids obtained in (4) gives the gliadin.

POTASH.

The work on this subject during the year was confined to the determination of potash in mixed fertilizers and moisture in potash salts. The reading of the report of the referee was followed by a general discussion. No action was taken by the association other than to refer the suggestions and recommendations contained in the report to the referee for next year.

Report of referee, F. B. CARPENTER.—Samples were sent to a large number of chemists, of whom 18 reported results. With one or two exceptions results by the official method for determining potash were fairly concordant, though in most cases considerably below the theoretical amounts present. A modification of the official method gave higher percentages of potash, but with less uniformity. A modification of the optional method of the association was tried, with the conclusion that it was too troublesome for practical work.

Numerous experiments were made by the referee for the purpose of determining the cause of low results on potash, and of devising some method for overcoming this difficulty. Neutralization with sodium hydrate instead of ammonium hydrate was tried with promising results. In this modification of the official method a small amount of hydrochloric acid is added to liberate any occluded potash in the substance, and sodium hydrate is used instead of ammonium hydrate to prevent any occlusion or absorption of potash in the precipitate.

No definite conclusions were considered warranted from the amount of work done. Further study of this modification was suggested. The results on moisture by the

official method were not very concordant. It was suggested that possibly better results might be obtained with a temperature somewhat lower than 130° C. The referee recommended that the association take some action as to the determination of moisture in potash salts by drying at a stated temperature or by ignition, and that the method thought most desirable be studied further, with a view to securing more concordant results.

SOILS.

The work on this subject under the direction of the referee related to the determination of available potash and phosphoric acid in soils, methods for the analysis of alkali soils, and a study of soil acidity. The association approved the referee's recommendation that tests be made of greater concentrations than $\frac{N}{200}$ hydrochloric acid for determining available phosphoric acid. The suggestions for further work on the solubility of phosphoric acid and potash in the different soil layers, an investigation of methods for determining total phosphoric acid, and the proposed method for the determination of water-soluble constituents in alkali soils were left to the discretion of the next referee.

Several changes in the official methods for the analysis of soils proposed by the referee were approved. These are two evaporations and filtrations for the removal of silica from acid solutions, the introduction of the volumetric method for phosphoric acid as an alternate method, and the requirement that in the determination of humus the filtered ammonia extract be clear and free from turbidity. The referee for next year was requested to test the value of proposed methods for comparing the ability of different soils to support the growth of nitrifying organisms under different conditions. The matter of testing the methods for determining water-soluble plant food in soils described in Bulletin 22 of the Bureau of Soils was brought up and referred to the next referee.

A report of investigations relating to the fixation of atmospheric nitrogen was presented by J. G. Lipman, and remarks concerning the use of Redonda phosphate on acid soils were made by H. J. Wheeler.

Report of referee, F. P. Veitch.—In a number of soils examined by the referee and C. C. Moore, potash and phosphoric acid were determined in extracts made with $\frac{N}{200}$ hydrochloric acid, and potash was also determined in aqueous extracts. The results indicated that the acid extraction usually removed less phosphoric acid and more potash than were removed by the crops grown. The referee therefore recommended that tests be made of stronger acid solutions in the determination of phosphoric acid.

The results with water as a solvent for potash were not considered as bearing out the indications of preliminary work, but were believed to be of sufficient significance to justify further tests with the ratio of solvent to soil changed from 5 to 1 to 10 to 1. Methods for determining total phosphoric acid were also believed to need further investigation. The methods for alkali soils were tested by A. Seidell and B. E. Brown, attention being paid to the ratio of soil to water and the effect of time on the solu-

bility of alkali salts. No advantage resulted in extending the time of digestion beyond one day. The evidence obtained was considered as favoring the use of 50 gm. of soil to 1 liter of water. Provisional methods for the analysis of alkali soils were submitted by the referee.

Soil acidity was studied by the referee, whose report upon this subject contained a discussion of the relation of soil reaction to plant growth, a review of the experimental work done in this country on partial and complete neutralization, results of extended tests of the sodium chlorid and lime-water methods proposed at the last meeting of the association and described in the proceedings, and a consideration of the nature of soil acidity. From the results of his own experiments relating to the effects of acid and alkaline reactions upon plant growth and a study of available data on this subject, the referee tentatively concluded that a soil slightly alkaline from carbonate of lime furnishes the best condition for the economical production of crops, and that any method for estimating the acidity or the lime requirements of soils should be based upon this hypothesis. The results by the sodium chlorid and lime-water methods diverged as the amount of organic matter in the soil increased, in most instances higher results, except possibly in soils deficient in organic matter, being obtained by the lime-water method.

Data were submitted which indicate that acidity as determined by the sodium-chlorid method is due to the solution in sodium chlorid of acid-salt-forming bases, plus the water-soluble acids, and that but little, if any, of the difficultly soluble organic acid material is estimated by this method. Only traces of free hydrochloric acid were found in any of the sodium chlorid filtrates from the soil. The lime-water method was believed to show beyond a doubt the amount of lime required under the most favorable condition of distribution to render the soil alkaline.

The referee believed that work should be directed toward determining how much of the total apparent acidity of soils must be neutralized in order to produce maximum yields economically rather than to further study of these methods.

The fixation of atmospheric nitrogen by bacteria, J. G. LIPMAN.—The literature of this subject was reviewed and several series of laboratory experiments were reported in detail. The behavior of *Azobacter vinelandii* isolated by Dr. Lipman was illustrated by the results of experiments in which the organism was grown in solutions containing either no nitrogen or only a small quantity of nitrogen. The fixation of nitrogen in cultures was found to increase as the surface exposure increased. The evidence was not conclusive as to the utilization or nonutilization of filter paper by the bacteria as a source of carbon. The presence of filter paper in small quantities seemed to increase nitrogen fixation, but when the amount was increased beyond a certain point a retarding effect was observed. A similar influence was noticed as the result of using different quantities of mannite.

The fixation of nitrogen by *A. vinelandii* was increased when this species was grown in the presence of a bacillus designated *B. 30.* A number of other organisms grown with *A. vinelandii* seemed to exert no influence. The intention of extending the experimental work to actual soil conditions was announced.

Redonda phosphate, H. J. WHEELER.—It was reported that Redonda phosphate, which contains from 35 to 40 per cent of reverted phosphoric acid, had been found, in experiments extending over a period of years, to have very little value when used upon an acid soil. When applied to a limed soil the results were very much better. Upon soil limed sufficiently to enable the growth of all ordinary crops in a satisfactory manner, but probably not alkaline in reaction, this phosphate was nearly equal in value for certain crops to some of the soluble phosphates. This was true of grass during a period of 4 years, but not true of Swedish turnips and beets. Millet and some other plants seemed to possess exceptional ability to use this phosphate on both limed and unlimed soils.

The after effect of Redonda phosphate on acid soils was practically nothing, but on limed soils was relatively much better, though poor in comparison with other phosphates. The common occurrence of acid soils in the United States and the reports that Redonda phosphate is used extensively in the manufacture of mixed fertilizers were pointed out as making this subject one of the utmost importance. It was believed that soils must be put in such a condition as to render Redonda phosphate effective or else methods of chemical analysis must be devised for discriminating against this material. In view of the facts stated it was considered desirable that the association take under immediate consideration the methods for the determination of phosphoric acid in commercial fertilizers.

DAIRY PRODUCTS.

G. W. Cavanaugh, as referee on this subject, made no formal report, but recommended further study of the effect of preservatives upon the albumin of milk, with special reference to the quantitative determination of albumin. This recommendation was approved. The paper noted below was presented in this connection.

Note on the Waterhouse test, modified, for the detection of renovated butter, G. E. Patrick.—In the Waterhouse test, as used by the author, the sample is melted in water instead of milk. It was reported that 4 samples of canned oleomargarine from Europe were found to granulate in this test the same as genuine butter, which modified somewhat views based upon earlier work and reported to the association 2 years ago. The results of several tests led the author to suggest that the granulation of butter in this test may possibly be affected by the pasteurization of the cream from which it is made.

FOODS AND FEEDING STUFFS.

The cooperative work done on feeding stuffs during the year was directed to the determination of fat and crude fiber. The association requested further study by the referee of the composition of the ether extract obtained from the residue from fat determination by the official method after this residue has been digested with pepsin, and a further comparison of the König and official methods for the determination of crude fiber and the determination of pentosans in the crude residue. A paper submitted by C. A. Browne reported work relating to the occlusion of fat as a source of error in analytical work, and to the determination of acidity in feeding materials. The attention of the association was called by H. W. Wiley to the work of the international committee on fertilizers and feeding stuffs concerning uniform methods for sampling.

Report of referee, F. D. Fuller.—Samples of distillers' grains and bran were sent to 11 analysts with directions for determining ether extract and crude fiber. In the determination of ether extract a comparison was made of the official method and the Dormeyer method. The average results obtained by the official method were 11.33 per cent for distillers' grains and 5.43 per cent for bran, the calculation being made to water-free substance. The corresponding percentages by the Dormeyer method were 11.84 and 5.52, showing higher results on both materials by the Dormeyer method.

In the estimation of crude fiber, the official method, the König method, and the König method modified by the additional treatment of the fiber with sodium hydrate as in the official method, were compared. The average results by the official method were 14.96 per cent for distillers' grains and 11.74 per cent for bran, by the König method 19.73 per cent for distillers' grains and 12.49 for bran, and by the modified König method 12.12 per cent for distillers' grains and 10.48 for bran. Inasmuch as the official method does not remove the pentosans and the König method fails to remove albuminoids, the two methods were not considered comparable. The modified König method gives a much purer fiber.

The nitrogen content of the crude fiber obtained from distillers' grains by the official method was 0.27, by the König method 1.94, and by the modified König method 0.26 per cent. In the crude fiber obtained from wheat bran by the König method the nitrogen content was 0.195, none being obtained from the crude fiber by the other two methods. The referee did not believe that the higher results by the official method were due entirely to the presence of pentosans, but that the glycerol-sulphuric acid mixture exerted a hydrolytic action upon the fiber in the König methods. From practically pure cellulose prepared by treating absorbent cotton successively with dilute sulphuric acid and dilute sodium hydrate only about 87.6 per cent of crude fiber was recovered by the König method.

The referee recommended research work to determine the true nature of the ether extract obtained after digesting the residue from the official method of fat extraction with pepsin and to prove or disprove that the glycerol-acid mixture of the modified König method has a hydrolytic action upon crude fiber.

Notes upon the analysis of feeding materials, C. A. Browne, Jr.—The attention of the association was directed one year ago by Dr. Browne as referee on cattle feeds to work by Beger, in which additional quantities of fat were obtained from certain materials rich in protein by subjecting the residues from ordinary ether extraction to digestion with pepsin and again extracting. During the year pepsin digestion before extraction was compared with the official method of the association on samples of rice bran and rice polish, the results showing no appreciative differences.

In the examination of the feces from steers fed these materials, on the contrary, very decided differences were obtained, the excess of fat extracted by the pepsin method amounting in one instance to over 4 per cent. In this particular case the coefficient of digestion of the feeding stuff calculated from the results obtained by the official method was 78.2 per cent and from the results obtained by the pepsin method 66 per cent, indicating the possibility of introducing a serious error in tables of digestive coefficients by the incomplete extraction of the fat. A similar source of error was observed in mixed feeds containing molasses, the occlusion in this case being attributed to the dried residue of sugars instead of to the protein constituents.

In determining the total acidity of feeding stuffs the author found extraction with 90 per cent alcohol and titration with deci-normal alkali very satisfactory. The results by this method in the case of rice meal were slightly higher than those calculated from the acid number of the fat, indicating the presence of other acids than free fatty acids.

FOOD ADULTERATION.

Upon the suggestion of the referee, W. D. Bigelow, the reports and papers on this subject were this year considered by the association as a whole, instead of in committee as heretofore. No reports were presented by the associate referees on saccharin products, wine, beer, vinegar, baking powder and baking chemicals, meat and fish, cereal

products, infants' and invalids' foods, vegetables, condiments other than spices, and tea and coffee. Attention was called to the report on cocoa and cocoa products, which is to be printed and submitted to the referees for criticism and approval before being formally presented to the association. Considerable work was done during the year on meat products and cereal products, but as the reports or papers upon these subjects related mainly to the separation of nitrogenous bodies they were considered under that heading. The reports were presented by the associate referees on colors, fruit products, distilled liquors, flavoring extracts, spices, oils and fats, dairy products, and preservatives. The four recommendations of the associate referee on distilled liquors, noted below, were approved. The report of the committee, favoring the insertion of the Hanus method of determining iodin absorption as a provisional method, was accepted. The methods recommended by the associate referee for the detection of preservatives and coloring matters in dairy products, the estimation of fat in cheese, and the analysis of condensed milk, were adopted provisionally, as was also a modification of the provisional method for determining glucose. A paper on the subject of saccharin products was read by A. E. Leach.

Report of associate referee on colors, W. G. Berry.—Owing to the large amount of work required in the preparation of a complete and systematic résumé of the subject of colors in connection with food stuffs, the associate referee presented only a provisional report upon this subject, deferring the complete report until another year. Some portions of the synopsis were elaborated. Collaboration was requested on the following points: (1) Solubility of the coal tar and vegetable dyes in various solvents; (2) extractive values of the various solvents for dyes in neutral, acid, and alkaline solutions; (3) characteristics of the natural coloring matters in fresh fruits, vegetables, and wines; (4) testing new methods noted in the various chemical journals.

Report of associate referee on fruit products, L. S. Munson.—It was stated that practically nothing had been done on this subject during the year. Several changes in the provisional methods necessitated by changes recently made in the official methods were recommended.

Report of associate referee on distilled liquors, C. A. Crampton.—Letters requesting cooperation were sent to a number of chemists, but reports were received from only two. These reports contained analytical data and suggestions for the determination of free and combined acids, aldehydes, furfurol, and coloring matters, and were given in full. The associate referee had expected to report upon a line of work relating to the establishment of standards which had been carried on by him for 5 years, and which formed the subject of a preliminary communication to the American Chemical Society at its last annual meeting (E. S. R., 14, p. 524), but found it necessary to postpone the report for another year.

The following modifications of the provisional methods of the association were recommended: (1) In the determination of alcohol, a higher dilution of the liquor before distillation; (2) in the determination of extract, evaporating nearly to dryness on the water bath, then transferring to a water oven and drying at a temperature of boiling water; (3) in the determination of fusel oil, the distillation of the sample with alkali to remove free acids and saponified esters; (4) in the determination of

ethereal salts, the titration of the excess of mineral acid and allowing for the subtraction of the volatile from the total acids.

The associate referee indorsed a recommendation of H. E. Sawyer that in the determination of acidity a change be made from sodium hydrate to barium hydrate for titration. He suggested that a comparative study be made of other methods of fusel oil determination. References to recent information concerning distilled liquors were given in the report.

Report of associate referee on flavoring extracts, A. L. Winton.—The methods outlined by the previous associate referee were considered as needing only slight changes. It was believed that in the near future certain new lines of work must be taken up, and special mention was made in this connection of lemon extracts and the artificial fruit ethers. The matter of lemon extracts was brought to the attention of the associate referee by the work of the Dairy and Food Department of Michigan. It was found in that State that an extract was being manufactured by treating lemon oil with dilute alcohol, which process removed the citral, but did not dissolve out any appreciable quantity of the oil. A second extract could then be made with the oil.

It was the opinion of the associate referee that the citral is not the only valuable ingredient of a lemon extract, but that the terpenes have a decided value. It was considered highly desirable that methods be devised for recognizing these two extracts, one designated the washed-out extract and containing only the citral and the other the extract made with the washed-out oil and containing only the terpenes.

By request of the associate referee the State analyst of Michigan, R. E. Doolittle, explained more in detail the legal features of the work mentioned. While the United States Pharmacopœia was accepted by the Supreme Court of Michigan as the standard in the preparation of lemon extracts, it was also held by the court that there was no violation of the statute in eliminating such ingredients as could be dispensed with without injury to the product as a food product. The manufacturers of washed-out extracts claimed a positive advantage in the total exclusion of the terpenes from the extract. In the test case a new trial was ordered, but as the defendant pleaded guilty no legal decision was reached as to the status of terpene-free lemon extract. Owing, therefore, to this decision and the absence of methods for determining citral, nothing further is being done in the State on the lemon-extract question.

Report of associate referee on spices, R. E. Doolittle.—The associate referee received no collaboration by members of the association during the year. Analyses were made by him of samples of pure pepper, the methods employed being those adopted provisionally by the association, and his comments were based upon this work. In the determination of starch by the diastase method the use of a pancreatic diastase was adopted in place of powdered malt. Inasmuch as the animal diastase gave no reduction on Fehling solution, one source of error was thereby eliminated. It was suggested that the use of this diastase be a subject for investigation by the associate referee on spices for the coming year. In the determination of the amount of copper reduced, the associate referee preferred weighing as cuprous oxid, as described by Munson last year. It was recommended that the various kinds of filters and containers suggested in the provisional method for the determination of crude fiber be thoroughly studied.

Report of associate referee on oils and fats, L. M. Tolman.—In work upon iodin absorption the Hübl method, the official method of the association, was compared with the Hanus and Wijs methods in collaboration with a number of analysts. The 3 methods did not give very concordant results on oils with high iodin numbers. On 51 samples of butter and 14 of oleomargarine examined by G. E. Patrick, the Hanus method invariably gave slightly higher results, the average differences being 1.01 and 1.14, respectively, in the 2 series. Eleven samples of pure olive oil were examined by 3 analysts, the average differences in the determinations being 1.8 by

the Hübl method, 1.2 by the Hanus method, and 1.7 by the Wijs method. The maximum differences were, respectively, 3.3, 1.9, and 2.8.

In the extended investigations of the associate referee comparative tests were made of the Wijs solution of iodin monochlorid in glacial acetic acid, the Hanus solution of iodin monobromid in glacial acetic acid, and the McIlhiney solution of bromin in carbon tetrachlorid. The objects in testing the Wijs and Hanus solutions were to determine the excess of reagent necessary, the length of time required, and the effect of light on the reaction. In tests on linseed oil an excess of the Wijs solution of 37 per cent gave the same results in 30 minutes as an excess of 62 per cent. An excess of the Hanus solution of about 70 per cent was found necessary to insure complete absorption in that time. Neither solution was appreciably affected by light in 30 minutes. It required 30 minutes with the Hanus solution to reach the constant stage reached by the Wijs solution in 10 minutes, after which the absorption was constant in both cases to the end of one hour, when a gradual rise occurred.

Tests were also made of the bromin solution and of the substitution of carbon tetrachlorid for acetic acid in the preparation of the Hanus and Wijs solutions. It was shown that good results could be obtained by the bromin solution only with dry reagents and in the dark, and furthermore, that the figures could not be compared with those of other methods. While solutions of iodin monochlorid and iodin monobromid in carbon tetrachlorid gave more reliable results, their use was also considered unsatisfactory for ordinary purposes.

Work on the Dalican titer test was carried on with the cooperation of the chemists of a number of packing houses. The detailed report upon this work was presented as preliminary. The larger number of chemists cooperating used practically the same modification of the Dalican test which was described. Particular attention was paid to the effect of the two methods of saponification in use, the use of tubes and air baths of different sizes, and the results obtained by different methods of stirring. The need of a uniform method of procedure was considered evident from the work so far done.

The associate referee recommended the adoption of the Hanus method in place of the Hübl method, a change in the official method for determining the index of refraction of oils and fats, as regards the factor used in the correction for temperature, and certain changes in the provisional methods as regards Halpen's test for cottonseed oil, and Renard's test for peanut oil.

Report of associate referee on dairy products, A. E. Leach.—The associate referee gave several methods to supplement those already included in the provisional methods of the Association for the analysis of foods, and recommended their adoption as provisional methods. These methods relate to the detection of formaldehyde, benzoic acid, and salicylic acid in milk; the detection of annatto in butter; the detection of azo dyes and annatto in oleomargarine; the detection of boric acid in butter; the determination of fat in cheese, and the analysis of condensed milk.

Report of associate referee on preservatives, W. D. Bigelow.—It was reported that no definite results had been obtained. No field in connection with food chemistry was considered to be more in need of study than the determination of preservatives. It was thought that in the near future it would be important to determine the amount of preservatives present in foods, and the methods suggested for this purpose were considered inadequate. During the year considerable attention was given to qualitative methods for the detection of formaldehyde and quantitative methods for the determination of salicylic acid and benzoic acid, the intention being to continue this work during the coming year. The referee requested as full collaboration as possible.

The determination of commercial glucose in some saccharine products, A. E. Leach.—The determination of commercial glucose in such products as honey,

jams, and jellies by the provisional method of the Association was reported as presenting certain difficulties due in part to the action of the acid used in inversion upon the maltose and dextrin. To obviate this it was recommended to neutralize the sample immediately after inversion. This method as elaborated was applied to 5 samples of commercial glucose, the polarization at 87° C. after inversion averaging 95.6 per cent of that at 22° after inversion and 93.3 per cent of the direct reading. To express results in terms of commercial glucose polarizing at an assumed figure, it was therefore considered necessary in the case of jellies and jams to divide the reading at 87° by 93 per cent of the assumed factor. It was announced that the study of this problem was being continued with the hope of working out a reliable formula for the calculation of invert sugar in the presence of commercial glucose.

E. Gudeman compared the methods given by himself and by Dr. Leach in the proceedings of last year's meeting, claiming greater accuracy for his method. Dr. Gudeman believed that the Association should adopt a constant for the polarization of glucose or accept a constant for the percentage of water and use these factors irrespective of the article under examination. He also contended that but one grade of glucose is manufactured in the United States at the present time, which statement met with considerable objection. The proposition to express results in terms of glucose polarizing at a definite figure seemed to meet with general approval. L. S. Munson considered the factor 175 too high.

SUGAR.

It was stated by the referee that very little work had been done on this subject during the year. The associate referee, L. S. Munson, reported progress on work with reducing sugars, stating that he had prepared a solution which had about one-third the action on cane sugar as the regular Soxhlet solution. The associate referee on reducing sugars for next year was instructed to communicate with a committee of the International Commission for Uniform Methods of Sugar Analysis with a view to cooperating in obtaining a uniform method for determining reducing sugars.

The appointment of an associate referee on molasses was authorized and a continuation of the work on beet-sugar methods was also requested. The method of determining the copper reduced by direct weighing of the cuprous oxid and the German official method for the determination of sucrose and raffinose were adopted as official methods in essentially the same form as recommended last year. The methods recommended last year as provisional methods were this year adopted as such. The principal recommendations made by the International Commission were briefly explained by H. W. Wiley. One paper relating to the analysis of molasses was presented.

Report of referee, L. M. Tolman.—This consisted of brief statements concerning the work on sugar during the year and of the several recommendations for next year's work noted above.

Remarks on molasses analysis, H. E. Sawyer.—The methods in use for testing molasses were considered unsatisfactory when applied to low-grade goods. In clarifying such molasses it was found more satisfactory to use a solution of basic lead acetate of greater dilution (26 gm. in 500 cc.) than that required in the official method. Tests were made of this method during a period of 2 years; and while it

was not claimed that sucrose could be determined by it with absolute accuracy in the case of a dark molasses, nevertheless the method was believed to insure increased accuracy, and the association was asked to give it consideration.

TANNIN.

Cooperative tests of methods for the determination of soluble solids and acidity in extracts were reported by the referee and several recommendations were made. The proposed changes in methods were referred to the referee for next year for consideration.

Report of referee, G. A. Kerr.—Samples of a fluid chestnut extract and a quebracho extract were sent to 16 analysts for the purpose of making comparative tests of the single filter paper in determining the soluble solids, investigating the correction for filter paper absorption adopted by the International Association of Leather Trades Chemists, and comparing a specified dilution with the variation allowed by the official method. Samples of hemlock liquor acidified by the addition of 0.15 per cent of acetic acid were also sent out for the purpose of testing methods for determining acidity.

Reports were received from 12 analysts. The results favored the use of the single-filter paper, confirming the work of the previous referee. The evidence relating to the correction of the tannin absorbed by the filter paper was not conclusive. Favorable results were obtained by diluting 1.6 gm. of the chestnut extract to 100 cc. and 0.6 gm. of the quebracho extract to 100 cc. and determining solids by the official method. The referee suggested that further experiments with varying quantities of extract be made for the purpose of comparing the total solids and assumed tannin content as bases for dilution. The acidity of the hemlock liquor averaged 0.1668 per cent by the provisional method and 0.1368 per cent by the animal charcoal method tested by the referee last year. The apparent loss of acid in the charcoal method was considered worthy of further study. Changes recommended by the referee in the official method were aimed to prevent the loss from evaporation during the weighing and filtering.

INSECTICIDES AND FUNGICIDES.

The referee reported considerable cooperative work, and made a number of recommendations concerning the adoption of methods and regarding work for next year. Method I for the determination of total arsenious oxid in Paris green as given in Circular 10 of the Bureau of Chemistry was adopted as an official method. The suggestions of the referee for future work were in the main approved. The general discussion relating to the determination of nicotin indicated a desire for an improved method. The subject of disinfectants was assigned to the next referee for investigation.

Report of referee, J. K. Haywood.—Further tests of old methods modified in some cases and of new methods were made by several analysts in collaboration with the referee. Reports were received from 8 analysts on Paris green, 8 on London purple, 4 on copper carbonate, 4 on potassium cyanid, 3 on soda lye, 2 on tobacco extract, and 3 on formalin. The analytical data with the comments of the analysts were reported in full.

The referee recommended that the following methods, given in Circular 10 of the Bureau of Chemistry and reported upon by the referee last year, be adopted as offi-

cial methods: Method I for total arsenious oxid in Paris green; the electrolytic method for determining copper in Paris green and copper carbonate; the volumetric silver nitrate method for determining cyanogen in potassium cyanid, $\frac{N}{20}$ silver nitrate being substituted for the $\frac{N}{10}$ solution; and the Kessling method for determining nicotin. It was also recommended that further study be made of the 4 modifications of the Avery-Beans method referred to in the report for determining total arsenic in Paris green, with a view to the adoption of the best modification as an optional official method; the volumetric method for determining copper in Paris green and copper carbonate; the removal of some of the organic matter in the analysis of London purple; the methods for the examination of soda lye; and especially the methods for determining formaldehyde.

ASH.

The vacancy caused during the year by the resignation of E. G. Runyan as referee on ash was filled by the appointment of G. S. Fraps, whose report dealt with the determination of sulphur and sulphates. The report called forth some discussion on the suitability of the sodium peroxid method for determining total sulphur. It was stated by G. E. Patrick that the use of sodium peroxid free from sulphur was found by him to give good results. The method for the determination of sulphates, which was described in the report of the referee last year, and which provides for the extraction of the substance with 1 per cent hydrochloric acid, was adopted provisionally. The Association approved the referee's recommendation for further study of the sodium peroxid method.

Report of referee, G. S. Fraps.—The nitric acid method, which is the provisional method of the Association, and the sodium peroxid method for the determination of total sulphur were compared by 5 analysts on samples of cowpeas and cotton-seed meal sent out by the referee. The average results showed that 0.466 per cent of sulphur as SO_3 was obtained by the nitric acid method and 0.544 per cent by the peroxid method in the case of cowpeas, and 1.048 and 1.135 per cent, respectively, in the case of cotton-seed meal, showing that the nitric acid method gave lower results than the peroxid method.

Considerable difficulty was experienced by some of the analysts in the use of the peroxid method. Sulphates were determined in a sample of sorghum by 4 analysts, the method used being that described in the report of the referee on ash last year. The results obtained by the different analysts ranged from 0.324 to 0.4 per cent and were considered fairly satisfactory. The referee recommended that the method referred to for the determination of sulphates be adopted provisionally, and that the peroxid method of determining sulphur be subjected to further study with a view of replacing the nitric acid method by it.

MISCELLANEOUS.

W. Frear as chairman of the committee on food standards reported upon the work of this committee during the year. Definitions and standards were formulated by the committee and submitted to the Secretary of Agriculture for his approval and use in fixing standards

for food products as required by law. The report of the committee was accepted and the committee continued.

H. W. Wiley as chairman of the committee on fertilizer legislation reported that the members of the committee were individually in favor of National legislation on the subject of fertilizers, but that there had been no expression on the part of the committee as to the form which this legislation should assume. The committee upon motion of the chairman was therefore instructed to confer with interested parties with a view to presenting at the next meeting a definite report upon this subject.

A committee of the American Chemical Society, appointed for the purpose of investigating the purity of chemicals, held a meeting in Washington, November 20 and 21, and by request presented to the Association an outline of the work being done.

A resolution was adopted inviting the Bureau of Standards to coöperate with the referees as far as possible in establishing the accuracy of methods of analysis.

Provision was made for the appointment of an additional referee next year on the subject of medicinal plants and the drugs made therefrom.

By a resolution introduced by L. L. Van Slyke the secretary was requested to print the recommendations of the referees as approved by the association for distribution at as early a date as possible.

A resolution in favor of holding the next convention of the Association at St. Louis was adopted.

OFFICERS AND REFEREES.

The following officers were elected:

President, M. E. Jaffa, Berkeley, Cal.; *Vice-President*, C. L. Penny, Newark, Del.; *Secretary*, H. W. Wiley, Washington, D. C.; *Additional members of executive committee*, W. P. Headden, Fort Collins, Colo., and W. R. Perkins, Agricultural College, Miss. The referees and associate referees have not as yet been appointed. They will be announced later.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of small amounts of potassium in aqueous solutions, F. K. Cameron and G. H. Failyer (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1063–1073*).—The method proposed is based on a suggestion of Morrell, and in brief "is to separate the potassium from other bases in the form of the potassium platinic chlorid, carefully free from an excess of reagents, take up in water and then add an excess of potassium iodid, when, on standing, a beautiful pink or rose color develops, which gradually deepens to a maximum intensity. By matching the intensity of the color against that which would be developed in a standard solution of known concentration, a measure of the amount of potassium present could be obtained."

Tests of different modifications of the method under a variety of conditions, which are reported, lead to the conclusion that the method is simple, easy of manipulation, and susceptible of a high degree of accuracy in the determination of minute quantities of potassium.

The volumetric determination of potash as potassium bismuth thiosulphate, F. W. Küster and M. Grüters (*Ztschr. Anorgan. Chem., 36 (1903), pp. 325–331; abs. in Chem. Centbl., 1903, II, No. 16, p. 908*).—As a result of numerous tests of Carnot's method of determining potash as potassium bismuth thiosulphate the authors conclude that it is impossible to obtain this salt free from the sodium salt, and therefore the method is unreliable.

On a colorimetric method for the estimation of phosphates in the presence of silica, O. Schreiner (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1056–1062*).—The method here described in full has already been noted (E. S. R., 14, p. 524).

The reduction of nitric acid in metallic nitrates to ammonia by the electric current, W. H. Easton (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1042–1044*).—A brief account is here given of a study of the precautions to be observed in using Vortmann's modification[a] of Luckow's method,[b] which is as follows: "The solution of the nitrate is placed in a platinum vessel with a sufficient amount of pure copper sulphate and it is then electrolyzed. It is advantageous to use a feeble current (1 to 2 cc. of oxyhydrogen gas per minute). When all of the copper is deposited, the residual liquid is evaporated to a small bulk and the ammonia distilled off as usual."

A small improvement in the Kjeldahl method, Grégoire and Carpiaux (*Bul. Assoc. Belge Chim., 17 (1903), No. 1, p. 36; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 18–19, p. 1102*).—It is suggested that the difficulty due to frothing in case of substances rich in fat may be overcome by adding to the liquid in the distilling flask a small quantity of calcium chlorid.

The relation between the solubility of lime in the presence of alkalis and the caustification of alkaline carbonates, A. D'Anselme (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 18–19, pp. 936–939, fig. 1*).

[a] Ber. Deut. Chem. Gesell., 23 (1890), pp. 2798–2801.
[b] Ztschr. Analyt. Chem., 19 (1880), pp. 324–327.

Solubility of gypsum in the presence of metallic chlorids, N. A. Orlov (*Zhur. Russ. Fiz. Khim. Obshch., 34 (1902), pp. 949–951; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 2, p. 199*).—The author studied quantitatively the influence of varying quantities of the chlorids of sodium, calcium, and magnesium on the solubility of gypsum in water. Solubility decreased with an increase in concentration of the calcium chlorid solution and increased with an increase of the strength of the sodium chlorid solution up to 10 to 15 per cent. The solubility in the latter was much greater than in the former, and in magnesium chlorid was greater than in either, being about 10 times as great as in calcium chlorid solution of 10 per cent strength.—P. FIREMAN.

The standardization of potassium permanganate solution for determining calcium and oxalic acid, H. Walland (*Chem. Ztg., 27 (1903), No. 76, pp. 922, 923*).

Laboratory method for ordinary chemical examination of waters for irrigation and domestic purposes (*California Sta. Circ. 8, pp. 4*).—Quick methods, mainly volumetric, are given for the determination of total residue, soluble and insoluble salts, chlorin, sodium carbonate, and nitrogen as nitrates. The methods are based mainly on those of Sutton, and it is stated that they "are intended merely for tests of waters for ordinary purposes, such as irrigation and domestic use, and are nowise intended to supersede the more elaborate and accurate methods given in books on water analysis, when such are necessary."

The use of calcined magnesia in the incineration of organic substances, H. Klein (*Chem. Ztg., 27 (1903), No. 76, p. 923*).—An admixture of 60 to 75 per cent of calcined magnesia is recommended.

Studies on the vegetable proteins, T. B. Osborne and I. F. Harris (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 448–467*).—This article is made up of abstracts of a series of papers which have already been noted from another source (E. S. R., 15, pp. 221–223), with the exception of one article, which is noted below.

The solubility of globulin in salt solutions, T. B. Osborne and I. F. Harris (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 464–467*).—This is a brief account of investigations which it is the intention to extend and report upon in detail. Statements are made concerning the solvent action upon edestin of each of a large number of salts. Many unexpected relations between protein and salts were found to exist. A further study is considered necessary before generalizations can be made.

Concerning avenin, St. Weiser (*Arch. Physiol. [Pflüger], 98 (1903), No. 11–12, pp. 623–630*).—An alkaloid called avenin has been reported by earlier investigators as present in oats. A repetition of such work and additional studies led to negative results, and the author concludes that no alkaloid is present in oats.

The sulphur contents of gelatin and its estimation with the Mahler bomb calorimeter, O. Krummacher (*Ztschr. Biol., 45 (1903), No. 3, pp. 310–323*).—According to the author's investigation commercial gelatin contains, on the dry matter basis, 0.62 per cent sulphur, of which 0.36 per cent is present as sulphate and 0.04 per cent as sulphite, and purified gelatin 0.28 per cent sulphur, 0.01 per cent being sulphate and a like amount sulphite. The organic forms in which sulphur can occur in gelatin are spoken of, together with the bearing of the analytical data reported on the use of gelatin in feeding experiments. The determinations of sulphur were made after the combustion of a sample in the bomb calorimeter and this method of analysis is described and discussed.

Action of diastase on the starch granules of raw and malted barley, A. R. Ling (*Chem. News, 88 (1903), No. 2288, pp. 168, 169*).—"The starches of barley and other cereals differ from that of the potato in being readily attacked by a solution of diastase in the ungelatinized condition." Different barleys give different constants, and it is probable that the products formed in barley mashes differ from those resulting from the hydrolysis of starch paste.

Animal and vegetable fixed oils, fats, butters, and waxes, C. R. A. WRIGHT (*London, 1903, 2. ed., pp. XVI+804, figs. 154*).—This work has been edited and partly rewritten by C. A. Mitchell, mainly with a view to rendering it capable of being used as an analytical text-book.

Thermodynamics and chemistry, P. DUHEM, trans. by G. K. BURGESS (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1903, pp. XXI+445, figs. 140*).—The topics treated are work and energy, quantity of heat and internal energy, chemical calorimetry, chemical equilibrium and the reversible transformation, the principles of chemical statics, the phase rule, multivariant systems, monovariant systems, multiple points or transformation points, displacement of equilibrium, bivariant systems, mixed crystals, critical states, chemical mechanics of perfect gases, capillary actions and apparent false equilibria, genuine false equilibria, unequally heated spaces, and chemical dynamics and explosions.

BOTANY.

Morphology of angiosperms, J. M. COULTER and C. J. CHAMBERLAIN (*New York: D. Appleton & Co., 1903, pp. X+348, figs. 113*).—This volume supplements that by the same authors on the Morphology of Gymnosperms, but must be considered as an independent treatise, Gymnosperms and Angiosperms being recognized as independent groups coordinate with Pteridophytes. The work is the outgrowth of lectures and laboratory work given graduate students at the University of Chicago, and while a vast amount of material is brought together in an orderly arrangement, the book must not be considered in any sense a mere compilation, since the same ground has been repeatedly gone over by the authors and their students, their results serving as checks to other investigations, as well as contributing a considerable amount of new material.

No attempt is made to include the elementary details of floral structure, anatomy, etc., which are well described in many of the older text-books, but where anatomy contributes to phylogeny, a nearly neglected field in this country, chapters have been prepared by Prof. E. C. Jeffrey. The volume seeks to give to the advanced student a continuous account of the structures involved, and to the research student the details of groups and bibliography that he needs. The bibliographies, which are an important feature of the work, are arranged chronologically at the end of each chapter and all the citations are brought together at the close of the volume, the arrangement being alphabetical by authors.

Concerning stimulants to plant growth and their practical application, O. LOEW (*Landw. Jahrb., 32 (1903), No. 3, pp. 437–448, pls. 2*).—The results of pot and plat experiments with barley, Chinese cabbage, spinach, rice, peas, oats, and radishes are given in which the stimulating effect of a number of chemicals is shown. Among the chemicals tested were rubidium chlorid, sodium fluorid, potassium iodid, manganese oxid, uranium nitrate, and iron sulphate, all of which were found to be injurious to plant growth when used in considerable strength, but weak solutions showed a decidedly stimulating effect. Based upon the results obtained with manganese oxid and sodium fluorid, the author claims that under the conditions of the experiments, notwithstanding the high price of these chemicals, they have a distinct value in agricultural practice.

A study of the production of electricity in living organisms, L. QUERTON (*Trav. Lab. Phys. Inst. Solvay, 5 (1902), No. 2, pp. 81–185; abs. in Bot. Centbl., 93 (1903), No. 7, pp. 145–147*).—After considering the general electrical phenomena as exhibited by living organisms, such as electric fish, muscles, nerves, plants, etc., the author gives an account of experiments with plants and the application of the electric manifestations to biology and irritability. He examined the plants by exposing them to light, testing the electric impulse by a specially devised apparatus. The

leaves of iris, begonia, and tobacco were found to agree essentially in the illuminated portion forming the negative pole, the current reversing itself after the illumination had ceased. The leaves of the garden tropæolum and Mathiola were the reverse of the preceding, the illuminated portion being the positive pole.

The experiments seem to show that the difference in electric potentiality in plants, when acted upon by light, is due to the chemical activity of the leaf, being particularly associated with the phenomena of chlorophyll assimilation. The electric phenomena were observed in living plants only. When the green leaves had been subjected to boiling water or destroyed by dry heat there was no electric response. Temperature was found to favor the production of electrical phenomena, and about 25°C., the same temperature as the optimum for assimilation, proved to be the optimum for electrical response.

In a second series of experiments the effect of chemical reagents on the electrical response was investigated. Oxalic acid, hydroquinone, and laccase are being tested. The general conclusion is drawn that whatever the organism examined the electric response is intimately connected with the chemical reaction of the organism.

A transpiration model, H. H. Dixon (*Sci. Proc. Roy. Dublin Soc., n. ser., 10 (1903), I, No. 9, pp. 114–121, fig. 1*).—A description is given of a form of apparatus in which the phenomena of turgidity of leaves of tall trees during the active transpiration and transpiration into saturated atmospheres may be observed. From the phenomena shown by the action of this model it is concluded that with imperfectly semipermeable membranes, such as leaf cells are supposed to possess, transpiration into saturated spaces is possible over long periods of time, and if photosynthesis is permitted such transpiration may be indefinitely prolonged.

The decomposition and regeneration of albuminous materials in plants, G. Balicka-Iwanowska (*Compt. Rend. Acad. Sci. Cracovie, 1903; abs. in Bot. Centbl., 93 (1903), No. 41, pp. 369–372*).—The author gives an extended review of the investigations of Pfeffer, Schulze, Prianishnikov, and others on the decomposition of albuminous materials in plants, followed by an account of experiments conducted by himself to test the accuracy of their conclusions. The methods of analysis adopted were those usually employed in such studies, and the author found that asparagin, which is formed during the decomposition of albuminous material, is a secondary product, the primary products of decomposition being amido acids and hexose bases.

The regeneration of albuminous material was found to be influenced to a very appreciable degree by the salts present in the soils. In the absence of lime there was found a decided diminution in the amount of albuminous material formed. Assimilation on the part of the plant was found to play a very important rôle in the formation of albuminoids, and his investigations confirmed those of Godlewski, who found that under the influence of light the increase in albuminoids depends to a large extent on the nitrates present without reference to the assimilative processes of the plant.

The localization of the active principles of certain plants during their winter stages, W. Russell (*Rev. Gén. Bot., 15 (1903), No. 172, pp. 160–165*).—A study was made of quite a number of species of trees, shrubs, and other plants during their dormant period, to determine the localization of alkaloids and other active principles which are characteristic of the plants. As a result of the investigations it seems that the alkaloids, glucosids, and other active principles are stored by the plant similarly to the ordinary reserve material, and that in certain plants there may be a slight transfer of the material during the dormant period. With those plants whose aerial portions are annual the active principles are localized in the subterranean organs. With those having perennial stems the concentration of the active principles is in the region of the buds, although frequently deposited to considerable extent in the underground organs.

Investigations on the presence of alkaloids and glucosids in the Ranunculaceæ, E. Vanderlinden (*Rec. Inst. Bot. Univ. Bruxelles, 5 (1902), pp. 135–178, pls. 2; abs. in Bot. Centbl., 92 (1903), No. 8, pp. 167, 168*).—A report is given of investigations of 39 species which represent the more important types of the Ranunculaceæ. The methods for recognizing the presence of alkaloids and glucosids are described, and the author reports the presence of alkaloids in *Caltha palustris, Delphinium hybridum, D. consolida, D. ajacis, D. staphisagria, D. grandiflorum, Aconitum lycoctonum, A. anthora, A. napellus, Nigella damascena,* and *Adonis vernalis.* In the case of the last species the substance found was an alkaloid glucosid. Glucosid reactions were observed in *Helleborus niger, Nigella sativa,* and *Aquilegia vulgaris,* while neither alkaloid nor glucosid was found in a number of other specimens examined.

In pursuing his studies the author found the alkaloids localized in the woody tissue and parenchyma of the roots, in the epidermis, and in the woody tissue and pith of the aerial organs. As a rule, the alkaloids were not found in the growing tips of the plants, but they appeared later in the developed portions. The alkaloids seem to be present as a waste product, and are found in the tissues which store up the starch, and when the carbohydrates are utilized by the plant they are left behind. On the contrary, the glucosids seem to be present as reserve material.

Microscopical examinations of some glucosids and tannins, A. Goris (*Thesis, Paris, 1903; abs. in Bot. Centbl., 93 (1903), No. 37, pp. 261–263*).—The principal investigation reported in this thesis is a study of esculin and tannin in *Æsculus hippocastanum* and *Pavia rubra.* The microchemical reactions of esculin and its compounds are described, and from the experiments the author is led to believe that esculin is formed by the plant without any direct action of light. It occurs in the embryo of the seed sprouted in darkness as well as in the light. The glucosid does not seem to be a reserve material, notwithstanding that during the autumn it disappears from the leaves, being transferred to the adjacent branches.

In addition to esculin a tannin is found in the horse-chestnut, which was also studied. This seems to be usually more or less modified, occurring in the same cells with the esculin, the glucosid often being found in combination with the tannin.

In the concluding part of the thesis the author reports studies on a number of analogous glucosids from other plants. Those studied were fustin, fraxin, daphnin, salicin, and cafein. These glucosids are, with the exception of daphnin, analogous to that observed in the horse-chestnut and are usually found in composition with the tannic acid. The author believes that probably most glucosids and alkaloids exist in the plant in combination with tannin, forming tannin glucosids or tannin alkaloids which are very soluble in water and alcohol and very unstable. The medicinal principles of many plants are believed to be present in these forms.

Investigations on the physiology of a green alga, P. G. Charpentier (*Ann. Inst. Pasteur, 17 (1903), No. 6, pp. 369–420*).—Based upon an extended series of experiments with *Cystococcus humicola,* the author claims that this alga is able to take carbon from glucose, inverted sugar, levulose, and saccharose solutions, as is done by cultures of molds and other fungi. In these cultures the coefficient of the utilization of carbon is higher for the alga than any mold or yeast investigated.

When grown in a confined atmosphere the early growth of the alga resembles that of a fungus, but later it behaves identically like that of other green plants. The Cystococcus was found to be able to synthesize its chlorophyll in darkness, and like other chlorophyll-bearing plants it stores its reserve starch in its cells. In its ability to take nitrogen from nitrates, and under certain conditions from ammonia, it resembles ordinary green plants.

A study of the structure of Botrytis cinerea, J. Beauverie and A. Guilliermond (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 9, pp. 275–281; 10, pp. 311–320, figs. 14*).—As a result of their studies the authors claim that there are 3 forms of *Botrytis*

cinerea, a typical spore-bearing form, an intermediate or transitory form, and one that is wholly sterile. These different forms, the authors maintain, are due to the nature of the medium in which the fungus is grown.

The poisonous mushrooms of France and Europe, O. GROSJEAN (*Les champignons vénéneux de France et d'Europe. Saint-Hilaire, Roulans (Doubs): Author, 1903, pp. 48, pls. 8, figs. 2, chart 1*).—A manual for schools as well as for private use, in which directions are given for the recognition of the poisonous or suspected species of mushrooms.

Synoptical tables of edible and poisonous mushrooms, C. MANGET (*Tableaux synoptiques des champignons comestibles et vénéneux. Paris: J. B. Baillière & Son, 1903, pp. 128, pls. 6, figs. 23*).—Synoptical tables are given for the determination and recognition of a large number of edible and poisonous mushrooms. Notes on their food value and suggestions for counteracting the poisonous effects when eaten are also given.

FERMENTATION—BACTERIOLOGY.

The classification and identification of bacteria, S. DE M. GAGE and E. B. PHELPS (*Reprint from Proc. Amer. Pub. Health Assoc., 1902, pp. 12–23*).—An outline is given of a scheme for the classification and identification of bacteria, with special reference to a description of the card catalogue system in use at the Lawrence Experiment Station for the records of species. These cards, which are specially prepared, are arranged to show all the necessary data for the classification and identification of species of bacteria and may be arranged by any system of grouping that is desired.

Experiments with nitrogen-assimilating bacteria, M. GERLACH and I. VOGEL (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 20–21, pp. 636–643*).—In previous publications the authors have shown the necessity of grape sugar in nutrient solutions for the best growth of bacteria of the Azotobacter group (E. S. R., 14, p. 1048). Continuing their investigations on this group of nitrogen-assimilating bacteria, the necessity for other materials in the culture media was studied. The organisms were shown in flasks containing the same quantity of a nutrient medium to which was added various forms of potash, soda, and lime, and the growth and nitrogen assimilation noted.

In those flasks which contained neither lime, phosphoric acid, nor potash there was no growth of bacteria nor gain of nitrogen. In flasks to which neither potash nor soda was added, but the other compounds were supplied, it was found that limited growth and nitrogen assimilation could take place. The effect of age on the organisms was studied and cultures from 18 to 328 days old were compared, the greatest gains in nitrogen being shown for the younger cultures. As reported in the previous paper, increasing the content of grape sugar increased the amount of nitrogen added by the organisms to the solution.

The presence of a number of yeasts and molds in the cultures was investigated, indicating that some of these organisms were apparently able to independently add small quantities of free nitrogen to their solutions. When grown in connection with Azotobacter the efficiency of the latter organisms to assimilate free atmospheric nitrogen seemed to be diminished.

Assimilation of atmospheric nitrogen by bacteria, E. DE FREUDENREICH (*Ann. Agr. Suisse, 4 (1903), No. 4, pp. 207–214; also in Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 16–17, pp. 514–522*).—The results of the studies of *Azotobacter chroococcum* are given, in which the author demonstrates the ability of this microorganism to assimilate free atmospheric nitrogen when grown either in liquid cultures or upon gypsum culture plates. Flasks containing liquid culture media inoculated with the bacteria added about 3.5 mg. of nitrogen in 9 weeks. When grown on gypsum the amount of nitrogen added was considerably in excess of that assimilated in the liquid media. The investigation shows that soils rich in bacteria are undoubtedly able to assimilate and fix free atmospheric nitrogen.

Concerning bacteria which assimilate carbon from the air, M. W. BEIJERINCK and A. VAN DELDEN (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 2, pp. 33–47*).—The results of a biological study of *Bacillus oligocarbophilus*, an organism said to be capable of deriving its carbon from the air, probably from volatile hydrocarbons and not from the carbon dioxid of the air. The organism has been cultivated on a number of media containing no source of carbon except that found in the air, and favorable growth was made under such conditions when all carbon dioxid was eliminated.

Recent progress in the field of soil bacteriology, H. BUHLERT (*Fühling's Landw. Ztg., 52 (1903), Nos. 13, pp. 451–457; 14, pp. 494–500*).—A review of work along this line, including a reference to the recent work of Beijerinck on *Bacillus oligocarbophilus*, which is capable of deriving its carbon from the carbon compounds of the air (not carbon dioxid). (See above.)

Some experiments with luminous bacteria, B. ISSATCHENKO (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 16–17, pp. 497–499*).—Attention is called to experiments by the author on some of the phenomena exhibited by luminous bacteria. Cultures of *Photobacterium phosphorescens* were made, and after several days' growth in culture tubes were placed with etiolated seedlings of clover, rye, and oats in an absolutely light-proof chamber. After remaining in this chamber from 24 to 48 hours the seedlings were examined, and it was found that the intensity of the light given off by the bacteria was sufficient for the formation of chlorophyll in the plants. This would seem to indicate that the quality of the light rays plays little part in the process of chlorophyll formation if the light is of sufficient intensity.

Notes on Bacillus coli and allied forms, S. DE M. GAGE and E. B. PHELPS (*Reprint from Proc. Amer. Pub. Health Assoc., 1902, pp. 1–11*).—Studies with *Bacillus coli* and allied forms, with special reference to the neutral red reaction, have been carried on at the Lawrence Experiment Station, at Lawrence, Mass., for a number of years. The authors found from their investigations that as a preliminary test the neutral red reaction is as sensitive and accurate as any which has been hitherto proposed. This reaction, however, has given positive results for other organisms than *B. coli*. For more delicate tests the authors recommend the dextrose broth method, which is fully described.

The spore germination of Bacillus subtilis and B. megatherium, L. F. RETTGER (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 14–15, pp. 433–438, figs. 3*).—The purpose of this paper is to draw attention to a "hanging-block" method recently described for the morphological study of micro-organisms, and to present in some detail the processes involved in the germination of these 2 species of organisms. The author finds that although these 2 species resemble each other closely in most respects, they differ very conspicuously in their method of spore germination. These differences may be readily made out in "hanging-block" cultures.

The cleavage of nitrogenous organic substances by bacteria, O. EMMERLING (*Die Zersetzung stickstoffreier organischer Substanzen durch Bakterien. Brunswick: Friedrich Vieweg & Son, 1902, pp. 141, pls. 7; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 12, p. 574*).

Fermentation organisms, A. KLÖCKER, trans. by G. E. ALLAN and J. H. MILLAR (*New York: Longmans, Green & Co., 1903, pp. XX+381, figs. 146*).—In this text-book the author gives a review of the biology of fermentation organisms, especially in the manufacture of beer. In spite of this limitation, the book is varied in character and treats of the general phenomena of fermentation.

The subject-matter is divided into 3 sections, the first of which traces the development of the science of fermentation. This is followed by descriptions of laboratory equipment and methods, special attention being given to the preparation of pure yeasts upon a commercial scale, after which the more important micro-organisms of alcoholic fermentation are treated at length. Bibliographies of the more important

researches in each department treated are given, and in many instances the experiments cited have been verified by the author. The practical applications are treated as well as the theoretical aspects of chemistry and botany in their relations to the science of fermentation.

Fermentation investigations, L. MATRUCHOT and M. MOLLIARD (*Rev. Gén. Bot., 15 (1903), Nos. 173, pp. 193–220; 174, pp. 253–274; 175, pp. 310–327, pls. 4, figs. 10*).—In addition to the fermentation produced by yeast and similar organisms the authors, following investigations by Pasteur, Lechartier, and Bellamy, show that there is a fermentation which takes place in fleshy fruits, tubers, etc., that is independent of yeast or other foreign organisms. The methods of the experiment are described in detail, fruits of pumpkins and apples, onion bulbs, beet roots, etc., being kept under aseptic conditions for a considerable time, and the alcoholic fermentation and carbon-dioxid evolution determined. In the first part of the report a morphological study is given of the cells undergoing self-fermentation, after which the results of cytological studies are given.

A critical review of the theory of fermentation, A. RICHTER (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 14–15, pp. 438–451, fig. 1*).—A critical review of the fermentation of sugars by yeast.

The micro-organisms of black bread fermentation, L. BUDINOFF (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 14–15, pp. 458–463*).—A review is given of the work of Halliger on the bacteriological investigations of bread fermentation, and the results of the author's investigations, particularly with Russian black bread, are reported.

Notes on recent work on vegetable ferments, W. G. FREEMAN (*West Indian Bul., 4 (1903), No. 1, pp. 22–28*).—A summary is given of some of the more recent investigations relating to vegetable ferments, particular attention being paid the ferments which have been discovered in the papaw (*Carica papaya*), the pineapple, and pitcher plants. In addition notes are given on various oxidizing ferments such as oxidases, laccase, tobacco ferments, etc.

The ferment of the tea leaf, II, H. H. MANN (*Calcutta: Indian Tea Assoc., 1903, pp. 15, figs. 2*).—In a previous publication (E. S. R., 14, p. 741) the author called attention to the nature of the ferment of the tea leaf, which was said to be an oxydase, the quantity present in the leaf depending in some way upon the percentage of available phosphoric acid in the soil. The action of this ferment in producing the tea of commerce was shown, and in the present publication the author considers the subject in some of its practical applications.

The question of adding enzyms from some other source to fermenting tea leaves was considered, but no advantage was found to follow such treatment. The increase of ferment during the withering of the tea leaves, as well as the changes taking place in the leaves, are described, and the conclusion is drawn that there is a point in the withering of the leaf when the enzym which causes the fermentation of the leaf is present in greatest quantity. The effect of withering too quickly or too slowly upon the action of the enzym and the chemical content of the leaves was examined, and it was found that by a loss of moisture the leaves may become withered before the proper amount of oxidizing enzym is present, or in wet weather it may become chemically ready for rolling long before the leaves are properly withered.

Investigations were continued on the effect of light and darkness in the production of the enzyms, and it was found that leaves exposed to ordinarily diffused daylight gave slightly better results than those kept in darkness. In a second experiment, where the bushes were covered, no difference could be detected after 2 weeks in the amount of oxidizing enzyms in 2 lots of leaves. It was found, however, that leaves plucked early in the morning contained a much larger amount of total enzyms than those gathered late in the afternoon. Whether this can be turned to practical account can not yet be told.

Experiments were conducted on the fermentation of tea under aseptic conditions which resulted in the discovery that the addition of a small quantity of salicylic acid to the fermenting tea leaves, by excluding foreign organisms, produced an improved quality of tea.

Some notes on proteolytic enzyms associated with rennet in plants, M. JAVILLIER (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 17, pp. 1013–1015*).—In a previous publication (E. S. R., 14, p. 549) the author has shown the presence of rennet or an analogous substance in certain plants, and in the present communication an account is given of certain proteolytic ferments which were found associated with the rennet in his studies on plants.

In experimenting with the expressed juice of darnel under aseptic conditions it was found that the coagulum formed by the rennet was gradually dissolved and in its place was formed a semitransparent liquid, upon the surface of which floated globules of milk fat. This substance was not precipitated by acids, and gave, in general, the reaction of peptones. The diastase which has been found in a large number of plants is a casease comparable with that previously described as occurring in liquid cultures of Tyrothrix. The plant juice of darnel contains a gelatinase which liquifies gelatin, but does not coagulate egg albumen nor fibrin.

In these experiments the author has shown that certain of the higher plants possess ferments similar to those discovered in experiments with bacteria, yeasts, molds, etc., and that the casease and gelatinase present in the plants studied are quite similar, if not identical. The diastatic precipitate separated from the darnel was found after a few days to dissolve peptone in a way quite similar to that of the diastase occurring in the mucus membrane of the intestinal canal of certain mammals.

A study of the proteolytic enzyms of malt, F. WEIS (*Compt. Rend. Trav. Lab. Carlsberg, 5 (1903), No. 3, pp. 133–285, pls. 17*).—After giving a historical résumé of the study of proteolytic enzyms and their presence in various plants, the author describes the methods of his investigations on the proteolytic enzyms of malt. As a result of his experiments he states that an aqueous solution of fresh malt was found to contain marked proteolytic properties, as is shown by the self-digestion of the malt and by the splitting up of albuminoid materials which may be added to the solution.

By means of precipitations with tin chlorid and tannic acid 2 phases were recognized in the proteolysis of protein separated from wheat, one a hydrolytic phase resulting in the formation of albumoses, the other a tryptic phase producing nonproteid crystalline compounds. These 2 phases are supposed to be caused by separate enzyms, peptase and tryptase. The action of various elements, such as temperature, moisture, acids, alkalis, etc., on these enzyms is shown, as well as the physical and chemical properties of each.

In the unsprouted barley grain the author was unable to demonstrate the presence of these ferments, but on the fourth day of germination they appeared quite abundant and increased to a maximum production in 16 days. There appeared to be proenzyms present in the unsprouted grain which at the proper temperature were rendered quite active upon the addition of very dilute acetic acid.

Investigations on the two kinds of catalase, O. LOEW (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 6, pp. 177–179*).—In the previous investigations of the author 2 forms of catalase were recognized, one of which is insoluble and the other a slightly soluble form. The insoluble form has been held to be a chemical combination of the soluble form with some nucleo-proteids. Criticisms having been made against this statement, the author has reviewed his experiments, arriving again at practically the same conclusion.

The catalytic decomposition of hydrogen peroxid, and nature and function of catalase, A. S. LOEVENHART and J. H. KASTLE (*Amer. Chem. Jour., 29 (1903), Nos. 5, pp. 397–437, fig. 1; 6, pp. 563–588*).—According to the authors it has

been found that in many instances the inhibition of the catalytic decomposition of hydrogen peroxid by various metals is due to the formation of thin insoluble protective films over the surface of the metal, the formation of which is brought about by the action of the inhibitor on the metal.

During the decomposition of hydrogen peroxid, the authors could observe no evidence of the formation of atomic oxygen. It has been found, however, that various catalyzers act as oxygen carriers in the presence of hydrogen peroxid, and that with the exception of catalase all substances which break down hydrogen peroxid act as oxygen carriers. It is believed that the physiological function of catalase is not to effect the decomposition of hydrogen peroxid as a means of protecting the cell against the toxic action of this substance, but rather that catalase is a substance or mixture of substances having a tendency to combine with hydrogen peroxid to form a very unstable holoxid derivative which immediately decomposes with the evolution of molecular oxygen. The authors are inclined to look upon catalase as a reducing substance, which may under some conditions combine with atmospheric oxygen to form an oxidase.

METEOROLOGY—CLIMATOLOGY.

Meteorology at the British Association, A. L. Rotch (*Science, n. ser., 18 (1903), No. 464, pp. 657–661*).—The author reports that meteorology received much attention at the Southport meeting of the association. This was largely due to the fact that the International Meteorological Committee met with the association, and thus brought together prominent meteorologists from different parts of the world. Meteorology also predominated in the Physical Section of the association, which was divided into two subsections, one of which recognized meteorology as a distinct branch of physics. A commission was appointed to study the relations of solar physics to meteorology; the continuation of exploration of the upper atmosphere by means of kites was recommended; and the author's project to study the atmosphere over tropical oceans by means of kites flown from steamships was indorsed.

"Professor Hildebrandsson announced that the discussion of the cloud observations which had been made simultaneously in various parts of the world indicated the following to be the circulation of the atmosphere at different heights: (1) Above the thermic equator and the equatorial calms there exists throughout the year a current from the east; (2) above the trades an anti-trade blows from the southwest in the northern hemisphere and from the northwest in the southern; (3) this anti-trade does not pass the polar limits of the trades, but deviates more and more to the right in the northern hemisphere and to the left in the southern, so as to become a current from the west over the barometric maximum of the tropics where it descends to increase the trade; (4) the regions situated at the equatorial limit of the trade join sometimes that of the trade, sometimes that of the equatorial calms, according to the season; (5) the pressure of the air diminishes gradually toward the poles, at least beyond the polar circles; (6) the upper layer of air in the temperate zones flows over the high pressures of the tropics and descends there; (7) the irregularities found at the surface of the earth, especially in the regions of the Asiatic monsoons, generally disappear at the height of the lower or intermediate clouds; (8) it is necessary to abandon completely the idea of a vertical circulation between tropics and poles, hitherto assumed, according to James Thomson and Ferrel."

The weather and practical methods of forecasting it, E. B. Dunn (*New York: Dodd, Mead & Co., 1902, pp. VIII+356, pls. 7, figs. 21*).—It is stated that in this work "it has been the aim of the author to avoid all mathematics, and scientific and technical terms, and present the subject in the simplest and most popular form. Rules and methods for determining weather changes are given from a personal and practical experience of the author covering nearly 30 years." The topics treated in

different chapters are the atmosphere, instruments, pressure of the air, temperature, winds, evaporation and humidity, condensation and precipitation, optical and electrical phenomena of the atmosphere, atmospheric disturbances, local storms, weather maps, climate, and how to foretell weather changes by the use of the barometer and local atmospheric conditions.

Weather conditions, W. Elliott (*Rpt. Dept. Agr. Northwest Territories, 1902, pp. 5–21*).—The general weather conditions of the Northwest Territories are described and tables are given which include data for rainfall at a large number of places during 1902 and previous years, temperature observations during 1902, and the relation between daily temperature, total precipitation, and crop yields for different districts from 1898–1902.

Report of the meteorological work of the Ploti Agricultural Experiment Station, M. Svolinsky (*Rap. An. Sta. Expt. Agron. Ploty, 8 (1902), pp. 1–23, charts 3*).—Observations on temperature of the air and soil, atmospheric pressure, humidity, precipitation, evaporation, cloudiness, sunshine, solar radiation, wind movement, and miscellaneous phenomena are recorded.

WATER—SOILS.

Colorado irrigation waters and their changes, W. P. Headden (*Colorado Sta. Bul. 82, pp. 77*).—This bulletin discusses the source, character, and conditions affecting the nature of the irrigation waters of Colorado, especially as typified in the waters derived from the Cache la Poudre River. Analyses of the waters of this stream at different points in its course, of the stored water of the stream, and of the ground water, drainage, and return seepage resulting from the use of the water in irrigation, are reported and discussed in detail. Analyses of the waters of a few other Colorado streams are also reported for comparative purposes, and a brief account is given of a study of the suspended matter carried by the Cache la Poudre in times of high water.

The results show that the character of the water of the Cache la Poudre, and of the mountain streams of Colorado in general, changes rapidly as soon as they enter the plains section of their courses. The amount of total solids in Cache la Poudre water was found to increase from 2.9 gr. per imperial gallon as the river leaves the mountains to 10.2 gr. as delivered to the town of Fort Collins less than 8 miles away. From the results of laboratory experiments and from the occurrence of strontium and lithium in the Cache la Poudre water the conclusion is drawn that the mineral matter held in solution by the streams in their mountain courses is due principally to the solvent action of water containing carbon dioxid on feldspar. "The amount of mineral matter which the Poudre carries through its canyon daily, assuming a flow of 300 second-feet, is nearly 26 tons." This is only about one-half as much as was brought into solution by laboratory experiments with fine-ground feldspar and carbonated water, viz, 4.536 gr. per gallon.

"The effect of storage is to increase the mineral matter held in solution. Some of the increase is derived from the ditches through which the water flows and from seepage directly into the reservoirs. A small increase, 0.5 gr. per gallon, is due to evaporation, but by far the largest increase is shown in instances where seepage water is either intentionally stored or flows into the reservoir." The mineral matter held in solution by stored water varies considerably with different reservoirs, and also differs from that of the streams from which it is derived. "The salts predominating in the water of the Poudre while it is a mountain stream are the carbonates, with some chlorids and sulphates, but as stored in Terry Lake and Windsor reservoir the carbonates have almost disappeared and their place has been taken by the sulphates. The amounts of calcium, magnesium, and sodium sulphates which

appear in the stored waters are large." The amount of potash present is not large and comes mainly from seepage water or other sources besides the river water.

"The amount of nitrogen, including all forms, added with the irrigation water, being less than 4 lbs. per acre, is negligible. . . .

"Water used in direct irrigation, that is, water conveyed by means of ditches directly from the river to the land irrigated, suffers less change than when stored, but does not by any means escape altogether."

Observations on the changes which water undergoes when used in irrigation "indicated that water flowing for 600 ft. over the plat experimented with, carried between 800 and 1,000 lbs. more salts in solution per acre-foot than the on-flowing water. The first water that flowed off gave much higher results, but subsequent samples showed a rapid falling off. The water entering the soil caused the solution of not less than 4,400 lbs. of salts per acre-foot, and probably very nearly three times this amount.

"The salts taken into solution by the water entering the soil and becoming ground water, are calcium, magnesium, and sodium sulphates. The salts dissolved in the next largest quantities were sodium chlorid and sodium carbonate. The amount of salts brought into solution in the ground water, due to the application of water to the surface, varies not only in the total amount of salts, but also in the relative quantities of the individual salts. The salt that went into solution the most freely in 1898 . . . was sodium sulphate, for which we found an increase of 1,430 lbs. in each acre-foot of ground water. In 1899, the largest increase was shown by calcium sulphate, an increase of 1,638 lbs. per acre-foot."

Some of the conditions which probably cause the variations in the relative solubility of the different salts are discussed. These include character and amount of water applied, character of soil, and temperature and other climatic conditions. The general conclusion is reached "that the salts in the ground water are essentially the same at all times, and the application of water to the surface, whether it be irrigation water or rainfall, does not change in any material way the salts present. The relative quantities in which they are held in solution in the ground water vary quite widely, while the causes of the variations are not evident."

The results obtained in a study of the relation between the composition of the ground water and drainage water, although not strictly comparable since the samples were not obtained from the same plats, lead to the conclusion that the drain waters at all times differ from the ground water. "They contain a smaller quantity of salts in solution, and are more uniform in this content than the ground waters. The salts present stand in a different order, especially in regard to their relative quantities, sodium sulphate sometimes disappearing entirely. Calcium sulphate is uniformly first in quantity, magnesium second, sodium carbonate third, and sodium chlorid fourth, with sodium sulphate quite irregular, but usually less than the sodium chlorid. The first significance of these facts is that our drains benefit our lands by removing the surplus water, rather than the useless or deleterious salts, from the soils. . . .

"Of the salts removed, the most injurious one, when present in sufficient quantity, is the sodium carbonate. . . . Sodium carbonate does not seem to be retained by the soil, or removed from solution by passing through it, while the sodium sulphate, or white alkali, is retained to a very marked extent." In the analyses reported the amounts of sodium carbonate in the ground water varied from 10 to 28 gr. per gallon, in the drain water from 11 to 23; sodium sulphate in ground water 89 to 105 gr., in the drain water 5 gr. The amounts of sodium chlorid and calcium and magnesium sulphates were also considerably less in the drain water than in the ground water.

"The amount of potash salts removed by the drain water [about 5 lbs. per acre-foot of water] was less than that found in solution in the ground water. . . . The

nitrogen carried by the drain waters is only a little more per acre-foot than the potash, it being 5.8 lbs. . . .

"We find the total solids in the return waters lower than in the ground waters, and having the same range as found for the drain waters. We find them characterized by the same salts, and in the same order in regard to their relative quantities, i. e., calcium sulphate, magnesium sulphate, and sodium carbonate, with sodium sulphate irregular in its quantity, but always subordinate, except in the sample of Arkansas River water taken at Rockyford, April 24, 1903, concerning which some doubts may be entertained, but which is probably correct, because the ground waters of that section are extremely rich in sodium sulphate. . . . The chief difference between the drain waters and the return waters taken from the rivers is in the potash present, which is greater in the return waters than in the drain waters. While some of the drain waters contain almost as much potash as the return waters, the latter are, as a rule, richer in potash than the former. The main features of these two classes of waters are, however, identical."

The amount of suspended matter in the water of the Cache la Poudre with a flood flow of 12,000 second-feet was found to be 2,800 tons per hour. Chemical analyses of this sediment showed it to differ but slightly in composition from the soils from which it was derived, being slightly richer in organic matter.

The underground waters of Arizona—their character and uses, W. W. SKINNER (*Arizona Sta. Bul. 46, pp. 271–296, figs. 2*).—"This bulletin is a compilation and discussion of the results of an examination of the ground waters of the Territory as to their suitability for sanitary, irrigation, and technical uses." The results of analyses of 235 miscellaneous samples of water collected in different parts of the Territory are reported. Some of these analyses are of special interest from sanitary and technical points of view, but there is not a sufficient number from any one point to permit of definite conclusions regarding the character of any local supply.

The purification of water supplies by slow sand filtration (*Jour. Amer. Med. Assoc., 51 (1903), Nos. 14, pp. 850–853; 15, pp. 909–911; 16, pp. 965–967; 17, pp. 1025–1027, figs. 9*).

Report of the chemical laboratory of the Ploti Agricultural Experiment Station, B. M. WELBEL (*Rap. An. Sta. Expt. Agron. Ploty, 8 (1902), pp. 69–116, chart 1*).—The work of this laboratory during 1902 followed substantially the same lines as in previous years (E. S. R., 14, p. 340). The data reported show that the average nitrogen content of the atmospheric precipitation during 3 years, 1900–1902, was 0.924 mg. per liter, or 3.9 kg. per hectare (3.5 lbs. per acre) in 1900, 5.2 kg. (4.6 lbs.) in 1901, and 3.7 kg. (3.3 lbs.) in 1902. The larger proportion of the nitrogen was in the form of ammonia. The ammonia content of different kinds of precipitation was found as an average of 3 years' observations to be as follows: Snow 0.915 mg. per liter, rain 0.964, rain with storms 1.229, early and late frost (*gelée blanche*) 2.7, hail 2.75, hoar frost (*givre*) 4.2, dew 5, and fog 5.57.

A study of the progress of nitrification in the soil under different conditions, by means of lysimeters 50 by 50 cm. in size, showed that from one-fifth to one-fourth of the water received in form of precipitation was recovered in the drainage. Taking only the days during which the temperature to a depth of 10 to 25 cm. did not fall below 5° C., the daily production of nitric nitrogen per hectare is calculated to have been 501 gm. in soil on which summer wheat had been grown and which had received no fertilizer or manure, 821 gm. in manured soil under summer wheat, and 876 gm. in soil bearing alfalfa. The production of nitric nitrogen in black fallow was about the same as in the manured soil.

Assuming that there are 125 days favorable to the production of nitric nitrogen in the soil during the period of growth of winter wheat, the author estimates that the first soil above referred to would furnish for this crop 63 kg. of nitric nitrogen per hectare (56.1 lbs. per acre), the second 103 kg. (91 lbs.), and the third 110 kg. (98 lbs.).

Analyses showed the nitrogen content of the crops in the 3 cases to be 83.5, 109.5, and 106 kg. per hectare (74.4, 97.5, and 94.4 lbs. per acre), a close agreement with the amounts indicated by the lysimeter measurements. The total amount of drainage water obtained from different lysimeters varied from 16.54 to 20.98 liters, yielding from 16.25 to 23.5 gm. of solid residue on evaporation. The relative proportions of the different constituents in the dry residue were as follows: Nitric nitrogen in the surface soil 45 to 46 per cent, in the subsoil 30 to 37 per cent; lime 25 to 32, organic matter 14 to 16, sodium and potassium chlorids 2.6 to 4, magnesia 1.8 to 2.4, sulphuric acid 1.7 to 1.9, silica 1 to 1.8, iron oxid and alumina 1.3 to 1.6. The amounts of some of these constituents per liter of drainage water are given as follows: Ammonia 0.2 to 0.5 mg., albuminoid nitrogen 0.8 mg., nitric acid very slight traces, phosphoric acid 1 to 3 mg.

A comparison of the amounts of nitrogen removed from the soil by different crops and returned in the residues was continued as in previous years. The results show that winter wheat required from 50 kg. of nitrogen per hectare (44.5 lbs. per acre) in seasons of poor yield to 85 to 100 kg. (75.7 to 89.1 lbs.) in seasons of good; winter rye 65 to 76–83 (57.9 to 67.7–73.9 lbs.) respectively. The residues of the former returned from 12 to 20 kg. of nitrogen to the soil, the latter 10 to 15. The previous conclusion that an increase in yield results in a decrease in protein content, especially in the grain, was confirmed.

The chemistry of the soil as related to crop production, M. Whitney and F. K. Cameron (*U. S. Dept. Agr., Bureau of Soils Bul. 22, pp. 71*).—It is stated in this bulletin that the chemical characteristics of soils have been given little recognition in the classification or mapping of soils by the Bureau of Soils "from the fact that the ordinary methods of determining the plant foods which a soil contains have not given results apparently related in any definite way to the yield of crops."

Discarding the various methods more commonly employed for the chemical examination of soils, for reasons which are explained, the water extract was adopted as the most satisfactory measure of the available plant food in soils, and methods for the rapid determination of small amounts of mineral matter in the water extracts have been worked out. After trying various means of getting soil solutions, including the use of a powerful centrifugal machine, "the Bureau finally adopted the convention of taking 100 gm. of the soil sample, stirring it vigorously for 3 minutes with 500 cc. distilled water, allowing it to stand 20 minutes for the coarser soil particles to subside, and decanting the supernatant solution containing more or less suspended clay and other solid matter." This solution was filtered under pressure through a Chamberland-Pasteur unglazed porcelain filter, and examined by methods which are briefly outlined as follows: "The bicarbonates are determined by titrating the filtered aqueous extract of the soil with a dilute acid solution, using methyl orange as an indicator; the chlorids by titrating with a dilute solution of silver nitrate, using carefully prepared potassium chromate as an indicator; the sulphates photometrically, using a modification of a method proposed by Hinds and Jackson; the nitrates by developing the color resulting from the addition of phenol-disulphonic acid, making the solution slightly alkaline with ammonia, and then comparing photometrically with a standard solution of potassium nitrate similarly treated; the phosphoric acid by comparing the color produced by adding molybdic acid to a solution containing phosphates in the presence of nitric acid with the color produced in a standard solution of sodium phosphate treated in a similar manner; the silica by the use of the nitric acid and molybdate solution, after allowing the soil solution to stand at least 1 hour, reading against the phosphate standard and subtracting the previous reading for phosphate; the potassium from the color produced when an excess of potassium iodid is added to a solution of a platinic salt and photometrically compared with a standard similarly treated, and the calcium and magnesium by an adaptation of the well-known Clark soap method, modified by Winkler, Wartha, and others."

The results of field examinations by these methods of the water extracts of several hundred oven-dried samples of 6 typical soils of varying degrees of productiveness from New Jersey, Maryland, and North Carolina are reported. From these results and from those of analyses of air-dried samples of type soils from various parts of the humid region of the United States the conclusion is drawn that "there is no apparent relation between the dissolved salt of the soils, as determined by the methods outlined above and the yield of crops, and that there are no constant differences between the different types of soil, although these types differ widely in their agricultural and crop values."

The extreme variations in the principal constituents of the water extracts of the 6 typical soils to which special attention was given were found to be as follows:

Variations in principal constituents of water extracts of typical soils.

	Number of analyses.	Parts per million of oven-dried soil.			
		Phosphoric acid (PO_4).	Nitric acid (NO_3).	Potassium.	Calcium.
Windsor sand	34	2.65–12.88	0.56–26.62	10.90–46.11	Trace– 47.50
Norfolk sand	98	1.71–16.52	.67–23.76	11.64–44.90	Trace– 46.86
Sassafras loam	80	2.24–21.45	.50–38.40	7.94–46.80	2.84– 62.72
Leonardtown loam	62	2.90–16.50	Trace–62.00	10.08–51.66	2.66– 34.22
Cecil sandy loam	57	.59–27.59	Trace–28.41	7.47–72.70	11.08–100.35
Cecil clay	120	2.40–40.60	Trace–34.12	4.93–83.80	10.70–102.85

The extreme variations found in analyses of air-dried samples of about 50 type soils from different parts of the eastern half of the United States were as follows: Phosphoric acid from 3.5 parts per million in Cecil loam (New Jersey) to 37.8 parts in Allegan gravelly loam (Michigan), nitric acid from 1.4 parts in Orangeburg sandy loam (Alabama) to 210.5 in Conestoga loam (Pennsylvania), potassium from 5.2 parts in Houston black clay (Texas) to 84 in Miami clay loam (Ohio), calicium from 2 parts in Cecil loam (New Jersey) to 213.2 in Orangeburg clay (Alabama).

The average of 147 of the analyses (the basis of selection of which is not stated) is reported as follows: Phosphoric acid 7.64, nitric acid 5.47, calcium 11.67, and potassium 22.74; and the conclusion is drawn that "while these values will undoubtedly vary somewhat as a result of wider investigations, it is believed that they represent closely the average figures for the great majority of cultivable soils as regards these several constituents, which the procedure used in this investigation will show; and so far as the investigations have been carried, it may be stated, no evidence has yet been found, except possibly in occasional samples, where the quantity of any one of these necessary plant foods was below the amount necessary for the support of a medium to good crop."

Results of examinations of the water extracts of soils at different depths are cited to show "that the soil proper does not contain materially more soluble plant food than does the subsoil." Examinations of soil water obtained by means of the Briggs centrifuge showed the soil solutions to be remarkably uniform, although the amounts of water originally present in the soils varied from 10 to 25, and widely divergent soil types were used. Data as to the effect of drying in increasing the solubility of the soil constituents are reported.

The authors state that in view of the results reported "the conclusion seems justified that, although differences in the dissolved salt content, or in the concentration and composition of the soil moisture, may be a factor in the yield as well as quality of a crop, it does not appear to be a major one in determining or controlling the wide variations observed in crop yields on different soils. It appears further that practically all soils contain sufficient plant food for good crop yield, that this supply will be definitely maintained, and that this actual yield of plants adapted to the soil

depends mainly, under favorable climatic conditions, upon the cultural methods and suitable crop rotation, a conclusion strictly in accord with the experience of good farm practice in all countries, and that a chemical analysis of a soil, even by these extremely delicate and sensitive methods, will in itself give no indication of the fertility of the soil or of the probable yield of a crop, and it seems probable that this can only be determined, if at all, by physical methods, as it lies in the domain of soil physics."

The influence of climate, texture of the soil, rotation, and variety of crop on the yield of crops, as well as the rôle of commercial fertilizers, are discussed. It is claimed that in view of the results reported in this bulletin "the rôle of fertilizers requires other explanations than those now generally accepted. There is no question that in certain cases, and in many cases, the application of commercial fertilizers is beneficial to the crop, . . . but whether [the] increase is due to an actual increase of the plant food in the soil, to an early stimulation of the plant to enable it to get its roots out into a sufficient volume of soil, or to some physiological or physical effect is not altogether clear."

The authors conclude "that on the average farm the great controlling factor in the yield of crops is not the amount of plant food in the soil, but is a physical factor the exact nature of which is yet to be determined."

Pineapple culture. I, Soils, H. K. Miller and H. H. Hume (*Florida Sta. Bul. 68, pp. 669–698, pls. 9*).—Chemical and mechanical analyses of 21 samples of soils, with corresponding subsoils, collected in different localities in Florida where pineapples have been successfully grown, are reported in this bulletin, with descriptions of the soils and of the local conditions and characteristic vegetation of the regions from which they were obtained, notes on sampling, and a general discussion of the requisites of a good pineapple soil. Comparing the results of the chemical analyses with the average figures given by Hilgard, it is shown that the pineapple soils are generally deficient in plant food.

"Few of the soils would be able to produce more than two or three crops of pineapples if all the plant food present were available. And when we consider that only a small proportion of this is actually in a condition to be taken up by the plants, we can readily understand why it is impracticable to produce pineapples on such soils without making liberal applications of a complete fertilizer.

"In a general way all our pineapple soils are shown to belong to the same type, a type which is marked by the absence of any appreciable amount of very fine sand, silt, and clay. The capacity of these soils for holding water is not great, inasmuch as the interstitial spaces are relatively large and are not altogether capillary, but are only such near the points of contact of the soil grains."

The sugar-cane soils of Jamaica, H. H. Cousins (*Bul. Dept. Agr. Jamaica, 1 (1903), Nos. 4, pp. 76–93; 5, pp. 97–109*).—Mechanical and chemical analyses of 31 samples of sugar-cane soils and 23 subsoils from different districts of Jamaica are reported, together with the results of fertilizer experiments on some of the soils. The wide variation in the character of the soils successfully used in sugar-cane production is noted. They vary from light gravelly sands to stiff clays and from soils containing almost no lime to those containing 50 per cent of calcium carbonate. All soils on which sugar-cane cultivation is normally successful present, however, on the whole a very high standard of fertility, the proportion of phosphoric acid being particularly high, while potash is the constituent of which there is the smallest available supply.

Reclamation of alkali land at Fresno, Cal., T. H. Means and W. H. Heileman (*U. S. Dept. Agr., Bureau of Soils Circ. 11, pp. 9*).—A brief account is given of experiments in drainage and flooding to remove alkali from a 20-acre tract of land 2½ miles south of Fresno. "Three-inch, 4-in., and 6-in. tile were laid over the tract at an average depth of a little over 3 ft. and 150 ft. apart. . . . The work of ditching

was commenced in December, 1902, and was completed in February, 1903." It was found to be impossible to obtain a gravity outlet for the drainage water, and a chain pump operated by a water wheel was installed to remove the drainage water. The total cost of ditching, tiling, and all incidentals except the cost of the pump and water wheel was $16.50 per acre.

"About the first of March, 1903, irrigation was commenced. The land was divided into 30 checks, the size of each check depending upon the slope of the land. The largest checks, those on the level land, are about 2 acres in extent, while on the steeper slopes they are less than half an acre. The object was to divide the land in such a way that it could all be kept under water to a depth of 4 in., and the reclamation was to be accomplished by maintaining the water at this depth until enough alkali had been washed out of the soil through the drains to enable a crop to be grown."

When the drainage system was installed 18 of the 20 acres contained too much alkali to produce a crop. After 4½ months of the treatment above described all of the land, with the exception of small spots, amounting in the aggregate to less than 2 acres, was considered ready for the sowing of alfalfa. On the basis of this demonstration of the feasibility of reclaiming alkali land by underdraining and flooding, the authors outline a general plan for the reclamation of the Fresno district, at an estimated cost of $10 per acre.

Soil temperatures at Lincoln, Nebr., 1888–1902, G. D. SWEZEY (*Nebraska Sta. Rpt. 1902, pp. 95–129*).—Observations on soil temperature have been made at the station during 15 years beginning with May 1, 1888, with thermometers placed at depths of 1, 3, 6, and 9 in., and 1, 2, and 3 ft. The readings for the years 1888 to 1893 have already been reported (E. S. R., 6, p. 123). A detailed tabular summary of daily readings for the years 1894 to 1902 is given in this article.

During 1891 readings were made 4 times daily during February and August for the purpose of studying the behavior of the diurnal wave of temperature. The data reported show "that the daily fluctuations in the air are nearly coincident in time with those at the surface of the ground and are not very different from them in amount; that the diurnal wave gradually progresses downward and at the same time gradually grows less marked until it finally disappears. In winter the daily maximum is reached in the middle of the afternoon; at depths of 3 to 6 in. the maximum occurs in the evening; at 1 ft. it is delayed till the following morning, below which it is scarcely appreciable, appearing, if at all, during the following day; the minimum temperature, which occurs in the air in the early morning, is propagated downward at about the same rate. In summer the daily range is considerably greater at all depths, the changes are appreciable to a depth of at least 2 ft., and are retarded to about the same extent as in winter."

A study of the monthly normals leads to similar conclusions regarding the progress of the annual temperature wave, that is, "the annual changes of temperature are greater at and near the surface of the ground than in the air itself, and that the annual range, like the diurnal, decreases with great regularity as we go down. The data also show that on the whole the air receives heat from the soil rather than the soil from the air; this follows from the fact that the soil is warmer than the air. . . . The temperature of the soil to the depth of a few inches is higher during every month of the year than is the air which lies upon it, and the deeper soil is warmer on the average than the air. . . . How much of this excess is due to the downflow of solar heat and how much to the upward flow of the internal heat of the earth does not appear from our data; we can only say that more of it comes from above than from below, but how much more we can not say because our observations do not reach deep enough. . . . At the depth of our deepest thermometer the flow of heat is downward rather than upward."

It was found "that the yearly maxima and minima are reached at practically the same time for the air and the upper few inches of soil, and that the annual wave of temperature progresses somewhat regularly downward, although of course somewhat distributed by temporary changes in the weather, requiring about a month to reach the depth of our lowest thermometer."

The movement of the frost line and periodic changes in temperature are briefly discussed.

Uses of peat and its occurrence in New York, H. Ries (*Albany: Univ. State of New York, pp. 36, illus.*).

The study of soils and agronomic charts, H. Lagatu (*L'étude des terres et les cartes agronomiques. Montpelier: Coulet & Son, 1903, pp. 31*).—This article discusses the preparation and use of soil maps or agronomic charts and reports studies of the quarternary diluvium of Vendres and the blue tertiary marls of the Montady basin with suggestions as to the fertilizer requirements and management of these soils.

The frontier of physiography, W. H. Hobbs (*Science, n. ser., 18 (1903), No. 460, pp. 538–540*).—This article explains the province and importance of a study of *epeirogenic physiography*, as distinguished from *orogenic physiography*, in its relation to the architecture of the earth's surface, and refers to investigations made in southwestern New England which indicate "that for a large area the earth's physiognomy is the outward expression of its internal structure." The results of this study in detail are to appear in a monograph of the U. S. Geological Survey.

FERTILIZERS.

Experiments upon the use of potash as a fertilizer, H. J. Patterson (*Maryland Sta. Bul. 89, pp. 165–196*).—This bulletin gives a brief historical account of the use of potash in agriculture; discusses the rôle of potash in plants, the quantity removed from soils by plants, origin and condition of potash in soils, sources and forms of potash fertilizers; and reports experiments begun in 1897 on tenth-acre plats, of medium, stiff, clay loam having fairly good drainage, for the purpose of studying "some of the underlying principles surrounding the use of potash fertilizers as to their time and method of application, their relation to other plant foods and ingredients which enter into the different sources of supply, and to make a general study of the effect of potash on the quality of the crop."

Kainit, muriate of potash, sulphate of potash, sulphate of potash and magnesia (double manure salt) were applied (1) just before planting, (2) for spring crops in the fall and fall crops in the spring. Other potash fertilizers used in the series of tests were carbonate of potash and magnesia, wood ashes, cotton-hull ashes, and silicate of potash. Lime at the rate of 800 lbs. per acre with muriate and sulphate of potash, and muriate of potash, with and without lime, combined with sufficient dissolved rock phosphate to furnish phosphoric acid equal to that in wood ashes were also tested in the series. One plat received barnyard manure at the rate of 5 tons per acre and a number of check plats received no potash.

The fertilizers were applied broadcast just before planting or 3 to 6 months before. The results obtained with 6 crops—corn, late potatoes, cowpeas, wheat, hay, and early potatoes—are reported and "with one exception, all favor applying fertilizers which contain much chlorids, several months before planting the crop, and those having the potash as sulphate at the time of planting the crop. The crop of cowpeas gave results just the reverse. It is a matter of interest to note that the results obtained give about the same figures favoring applying chlorids a considerable time before planting crop, as was obtained favoring the application of sulphates at time of planting the crop; that is, by excluding the cowpea figures, there was in 5 crops 3,527 lbs. more product obtained by applying chlorin potash salts 3 to 6 months

before planting crop, and 3,600 lbs. more by applying sulphates at time of planting crop. . . .

"None of the results show a very marked increase of product as a result of potash fertilization, yet they do point toward muriate as being the most efficient in producing an increase of crop. Sulphate of potash stands second; carbonate of potash and kainit indicate negative results." All of the fertilizers furnishing potash in the form of carbonate were effective in increasing the yield. "Cotton-seed hull ashes proved the most effective. . . . The carbonate of potash and magnesia, which is one of the Stassfurt productions, did not seem quite as active at the start, but with the 6 crops it produced a larger increase than wood ashes. . . . The carbonate of potash and magnesia produced on the 6 crops over double as much increase as was produced by the muriate of potash when compared to their respective nothing plats. . . .

"The use of lime with muriate and sulphate did not prove of any material advantage. . . . The use of lime with sulphate of potash was more effective in increasing yields than wood ashes, while the muriate of potash and lime was less so. Supplementing muriate with phosphoric acid, and with lime and phosphate in combination, gave [inconclusive] results."

The results of these experiments as well as of others made at the station indicate that the soil used is not as deficient in potash as in phosphoric acid. It also lacks organic matter and nitrogen.

No special effect of the potash fertilizers on the quality of the product was observed in the experiments reported in this bulletin, but in other experiments at the station on tobacco "it was shown that high-grade sulphate of potash produced the best tobacco, and carbonate of potash, as furnished by cotton-seed hull ashes, the next best. All potash salts which contained either much chlorin or magnesia produced a tobacco of poor quality, which cured badly and [showed] very poor burning [properties].

"In the tomato experiments, potash had a marked effect in increasing the yield and quality of the tomatoes. Tomatoes fertilized with potash were more solid, yet a little more acid."

Is nitrate nitrogen more effective than that of ammonia salts and is the ratio of 100:90 correct? BACHMANN (*Fühling's Landw. Ztg., 52 (1903), Nos. 4, pp. 132–138; 5, pp. 183–190*).—The results of a number of experiments with different kinds of crops are reported to show that when proper attention is given to the time and manner of applying ammonium salts they are often more effective than nitrates, and that Wagner's ratio of 100:90 is not correct. Early application in the spring seems to be the most important requirement for effective action of the ammonium salts on most crops. There is a considerable after-effect of the ammonium salts not observed in case of nitrates.

The manufacture of superphosphates and other common fertilizing materials, L. SCHUCHT (*Die Fabrikation des Superphosphats mit Berücksichtigung der andern gebräuchlichen Düngermittel. Brunswick: Friedrich Vieweg & Son, 1903, pp. XI+356, pls. 4, figs. 79*).—The manufacture of superphosphates is treated from both theoretical and practical standpoints. The preparation of phosphoric acid, double superphosphates, Thomas slag, bone meal, precipitated phosphate, and other citrate and citric-acid-soluble phosphates, etc., is also discussed. A chapter is devoted to methods of examination of fertilizers and another to means of preventing accidents, and various tables useful in connection with the manufacture and examination of the products are given.

A new adulterant of commercial fertilizers, A. BRUTTINI (*Staz. Sper. Agr. Ital., 36 (1903), No. 7, pp. 584–590*).—It is claimed that the residue from the mother liquor obtained in preparing salt from brines is used in the preparation of fertilizers. Its fertilizing value is shown to be low.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1903, No. 21, pp. 54*).—The results of analyses of 489 samples of fertilizers examined from March to June, 1903, are reported, with notes on valuation, the text of the State fertilizer law, and a brief discussion of proposed amendments of the law.

Complete report on commercial fertilizers for 1902, J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 85, pp. 110*).—This report contains a list of the fertilizers registered for sale in the State during the year and the results of analyses, with notes on the operation of the new fertilizer law and the source and value of various fertilizing materials.

Licensed commercial fertilizers, F. W. Woll (*Wisconsin Sta. Bul. 100, pp. 3–13, 18, 19*).—The text of the State fertilizer law is given and analyses of 17 samples of fertilizers licensed in the State during 1903 are reported with a brief general discussion of the subject of fertilizers.

FIELD CROPS.

Report on work at the Ploti Experiment Field in 1901-2 (*Rap. An. Sta. Expt. Agron. Ploty, 8 (1902), pp. 139–142*).—The work has been continued along former lines (E. S. R., 14, p. 340), but has been extended. This season winter wheat after corn yielded 930 kg. of grain and 2,400 kg. of straw, and winter rye after a cereal crop 960 kg. of grain and 480 kg. of straw per hectare less than a crop grown on cultivated fallow. Green manure seemed to increase the yield of winter wheat over cultivated fallow. These results were obtained on the extension of the experiment fields and represent only 1 season.

The results on the older portions of the field showed that the time of cultivating fallow was of great importance in growing winter wheat, and that it affected in a large measure the succeeding summer crop. The bare fallow gave the best yields of winter wheat and summer barley. Fallows cultivated in April and May gave about equal yields, but the quality was much in favor of April cultivation. A field under a 9-year rotation, including crops of leguminous forage plants of long periods of growth, produced much better yields of winter wheat and summer cereals than a field under a 4-year rotation.

Deep plowing produced the larger yields of sugar beets and winter wheat, while shallow plowing gave the larger yields in spring wheat. Shallow cultivation in growing winter wheat and oats by the Owsynski method was unprofitable this season as compared with deep cultivation.

Plats receiving barnyard manure showed an increase of 70, 56, and 28 per cent in the yield of wheat, lentils, and beets, respectively, as compared with the check plats. The addition of phosphates to barnyard manure had effect on the sugar-beet crop only, the increase in yield as compared with the manured land being 68.5 per cent. The results with complete fertilizers containing no calcium carbonate showed an increase of 12 per cent for cereals and 26 per cent for sugar beets over a complete application containing the substance. The use of superphosphate seemed to increase the weight of the grain of winter wheat, oats, barley, and lentils.

Annual Report of the Burdwan Experimental Farm for the year 1901-2, D. N. Mookerji (*Calcutta: Dept. Land Records and Agr., Bengal, 1903, pp. 13*).—A description of the farm is given, and the results of fertilizer, culture, and variety tests are reported. The chemical composition of 2 samples of the surface soil is also shown.

A mixture of bone meal and nitrate of potash, among different fertilizer applications for paddy, gave the best returns. This has been uniformly the case since the beginning of the experiments in 1891. Jute plowed under for green manuring, when

3 ft. high, gave a profitable increase in the paddy crop. Since 1889 cow manure has been the most effective fertilizer for jute. An experiment with sugar cane consisted in testing the relative merits of cow manure, bone meal, a mixture of the two, and a mixture of cow dung and superphosphate applied in quantities furnishing 250 lbs. of nitrogen per acre. All returns showed a small profit. The use of cow manure and bone meal gave the largest yield. Fertilizer tests with potatoes resulted in favor of manure kept in covered pits and moistened with the liquid manure of cattle. The use of *Sesbania aculeata* as a green manure for potatoes proved profitable as compared with unmanured plats.

During the last 4 years sowing paddy at the rate of 60 lbs. per acre has given decidedly better results than sowing one half that amount. The increase in yield this season due to seed selection amounted to 30 per cent. The ordinary method of planting sugar cane in shallow furrows yielded 49,236 lbs. and the method of trench planting 62,351 lbs. of cane per acre. Cuttings from the whole canes gave better results than top cuttings. In potato planting experiments the same weight of tubers as cut seeds gave a larger yield than whole tubers, but for the same number of plants per acre the results favor the whole tubers.

The results of variety tests were in favor of Diamond Harbor paddy, Kajli sugar cane, Amragachi potatoes, and Black Seeded sorghum.

Field experiments with fertilizers, C. E. THORNE (*Ohio Sta. Bul. 141, pp. 69–84, pls. 4*).—The plan of these experiments and a summary of the results up to 1900 have been published in previous bulletins (E. S. R., 13, p. 340). The work is being conducted at the station at Wooster and the branch station at Strongsville. The purpose of the present bulletin is to discuss the questions relating to the economical production of crops by the use of commercial fertilizers. Data thus far obtained at both places, showing the average yield, average increase in its value, cost of fertilizers and profit or loss per acre, and the effects of reducing the nitrogen and potash, the comparison of fertilizers of different percentage composition, and the influence of lime on clover, are given in tables.

The average value of the total increase in the 5-crop rotation at Wooster has been greatest on the plats receiving the largest applications of commercial fertilizers and barnyard manure, and these plats have also gradually outranked the others in net profit per acre. The results at Strongsville indicate that the applications of nitrogen and potash may be safely reduced to the lowest quantities used in this test. They further show that phosphoric acid is the dominant element in producing increase of crop on that soil. In these tests steamed bone meal proved more effective than raw bone meal, believed to be due to its greater fineness.

In 1900 an experiment was begun at the station to test the effect of lime upon clover, on soil poor in clover production. The average yield on plats receiving 1,000 lbs. of lime per acre, either alone or in combination with other fertilizers, was in some instances one-half ton per acre larger than on the corresponding unlimed plats. The author believes these results indicate "that on a soil which has become acid through exhaustive cultivation and the use of incomplete fertilizers, and on which clover refuses to grow, the addition of lime may restore the conditions essential to clover production."

The following conclusions are considered applicable to the kind of soil on which the experiments are being made, which is described as "a thin sheet of glacial drift, lying upon and largely modified by shales and sandstones of the Waverly formation.

"For the soils under test in these experiments phosphorus is the controlling element in producing increase of cereal crops, and neither nitrogen nor potassium will produce a profitable increase except when used in association with phosphorus.

"Except on soils which have been depleted by exhaustive cropping, the quantity of

phosphorus in the fertilizer, as compared with the nitrogen and potassium, should be much greater than that found in barnyard manure.

"While the effect of nitrogen in the fertilizer is secondary to that of phosphorus on these crops grown in rotation with clover, the considerably larger increase produced by fertilizers containing nitrogen, especially in the wheat crop on the worn soil at Wooster, is evidence that this element can not be entirely omitted from a fertilizer for such soils without loss of possible increase.

"Potassium apparently occupies the third place in a fertilizer for these soils, yet it is evident that some carrier of this element is essential to the highest effectiveness of the fertilizer.

"No definite ratio between the different constituents of the fertilizer can be fixed for all soils and crops. Apparently crops immediately succeeding clover or other legumes require less nitrogen in the fertilizer than those more remote, while the ratio between the phosphorus and potassium needed is probably chiefly determined by the geological history of the soil."

Fertilizer formulas for different conditions are suggested.

Infected alfalfa soil, C. G. Hopkins (*Illinois Sta. Circ. 70, pp. 2*).—Brief directions are given for the inoculation of land with infected alfalfa soil furnished by the station.

Experiments with buckwheat, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 84, pp. 467–474, pls. 5*).—Fertilizer and variety experiments with buckwheat have been carried on for 5 years at the station and near Reedsville, in Preston Co. At Reedsville in 1898 plats receiving 300 lbs. nitrate of soda, 400 lbs. sulphate of potash, and 400 lbs. acid phosphate yielded 17.5, 21.2, and 43.7 bu. per acre, respectively, as compared with 17.5 bu. on the check plat. The year following the yields on plats fertilized with 188 lbs. nitrate of soda, 90 lbs. sulphate of potash, and 77 lbs. acid phosphate were 10, 17.7, and 31.6 bu. per acre, respectively.

In 1900 acid phosphate exercised a beneficial influence wherever applied, whether alone or in combination, while nitrate of soda and sulphate of potash, either alone or used together, did not materially increase the yield. The plat receiving 400 lbs. acid phosphate ranked first, with a yield of 40 bu., while the plat receiving the same amount of nitrate of soda and sulphate of potash yielded 23.08 and 23.1 bu., respectively. The check plat in this series gave a yield of 22 bu. per acre.

The results of 1901 show that amounts of acid phosphate in excess of 150 lbs. per acre increased the yield but slightly. The plat which received no fertilizer in addition to 30 bu. of stone lime per acre applied in 1899 yielded this season 32.1 bu. per acre as compared with 22.7 bu. on the no-fertilizer plat. The last year of the experiments acid phosphate again showed its superior effect, and nitrate of soda and sulphate of potash gave the best returns when used in connection with each other. In the experiments at the station acid phosphate did not show such marked results, yet its beneficial effect was apparent.

In a variety test the average yields for 3 crops, 1 grown at the station and the others at Reedsville, were 31.3, 19.6, 18.1, and 20.8 bu. per acre for Japanese, Silver Hull, Gray, and Russian buckwheat, respectively. Seed from Ontario, Canada, yielded 3 bu. per acre more than seed grown in West Virginia.

Buckwheat was sown on 8 different dates, from May 5 to July 13, and the best yield was obtained from the sowing May 28, which was closely followed by that made June 6. Suggestions on the culture of the crop are given.

The continuous growth of mangels for 27 years on the same land, Barn Field, Rothamsted, A. D. Hall (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 27–59, figs. 9*).—An account is given of the experiments in the continuous growth of mangels on the same land, which form a part of the Rothamsted investigations.

After describing the experiment and reporting the results in detail, the author concludes—

"That mangels can be grown continuously on the same land without injuring the tilth of the land or the health of the crop. That a liberal dressing of farmyard manure forms the best basis of the manure for mangels. That the crop will further respond to considerable additions of active nitrogenous manures to the dung, particularly of nitrate of soda. That a free supply of potash salts is essential to the proper development of the mangel, hence a specific potash manuring is desirable even when dung is used in large quantities, and on a strong soil initially rich in potash. When nitrogenous manures are used in addition to dung, the potash salts should be increased pro rata, in order to maintain the health and feeding value of the crop and to bring it to maturity. That, in conjunction with dung, superphosphate or other phosphatic manure is hardly necessary and will give little appreciable return, especially when the crop is grown in rotation. That, as soluble alkaline salts are beneficial to the mangel crop, either as direct foods or as economizers of potash, a dressing of salt should always be included among the manures for the mangel crop."

A variety test of oats, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 84, pp. 475–480*).—Of 24 varieties grown in 1900 Extra Swedish, Black Prolific, Silver Mine, White Bonanza, American Banner, Big Four White, Imperial American, and White Russian, given in the order of their productiveness, yielded from 60 to 67.8 bu. per acre. The lowest yield obtained from any variety was 35 bu. In 1901, 5, and in 1902, 7, of these varieties were again among the 8 leading sorts. The influence on the yield of the distribution of rainfall during the growing season is shown.

On the viability of shelled oats, J. A. Andersson (*Landtmannen, 13 (1902), No. 42, pp. 676–678*).—Trials conducted by the author showed that shelled oats are considerably inferior to unshelled oats, not only as regards viability and germinative energy, but also in yield. The latter was 20 to 25 per cent lower in case of the shelled oats, under similar cultural conditions for both kinds of grain.—F. W. WOLL.

The rape plant; its culture, use, and value, J. H. Grisdale (*Canada Cent. Expt. Farm Bul. 42, pp. 6*).—General and brief directions are given for the culture of the rape plant, and the uses of the crop in feeding different kinds of farm animals are noted.

Distance experiments with sugar beets, J. J. Vaňha (*Centbl. Agr. Chem., 32 (1903), No. 8, pp. 538, 539*).—Sugar beets were grown 20, 25, and 30 cm. apart in rows 35, 40, and 45 cm. distant. The distance allowed each plant ranged from 700 to 1,350 sq. cm. The smallest yields were obtained from the 35 cm. rows with the plants at intervals of 30 cm. Planting the beets 30 cm. apart in rows 45 cm. distant gave much the best yields.

Distribution of sugar in the beet, I. Zlobinski (*Vyestnik Sakh. Prom., 1903, No. 21; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 4, p. 499*).—Taking his investigations as a basis, the author describes the portion of the beet richest in sugar to be a narrow zone around the center of the root.—P. FIREMAN.

The effect of removing or injuring the leaves of sugar beets on the development of the plant, H. Claassen (*Centbl. Agr. Chem., 32 (1903), No. 8, pp. 539–541*).—Experiments were made to determine the effect of removing some of the leaves of sugar beets while the plants are still growing. In one row the small inner leaves of the plant were entirely cut away; in another row the larger outer leaves were removed; while from all except the smaller inner leaves of the plants in a third row, one-half of the leaf surface was cut away; and in the fourth row the leaves were mutilated in a manner approximating injuries due to hail.

The smaller inner leaves were soon replaced after their removal by a new growth. The larger leaves were not replaced, but the remaining ones made a good vigorous

growth, so that by the end of the season the ground was again well covered. The injured leaves remained green and fresh, and the smaller inner leaves of these particular plants were induced to make a better growth by this treatment. The results showed that the removal of the leaves and injury to the same had practically no effect on the sugar content, but that it reduced the weight of the beets. Cutting away the inner leaves had the least effect. It is estimated from the data obtained that the removal of entire leaves, or parts of the same, whether by hail or otherwise, may cause a reduction of 30 per cent in the weight of the crop.

Investigations with sugar cane (*Verslag. Proefstat. Suikerriet, West Java, 1903, pp. 85–94*).—Water cultures of sugar cane were successful in development when nitrogen was furnished in the form of nitrate of potash, while plants given nitrogen as ammonium sulphate perished. The plants seemed to absorb the ammonium sulphate, but were incapable of assimilating it. It is concluded from these results that under field conditions cane draws upon the nitrates for its nitrogen supply and that ammonium sulphate can be useful to the plants only after it has undergone nitrification.

The increase in the weight of dry matter was studied by making 200 sections of a leaf in the morning, and the same number at different times during the day from leaves of the same plant and apparently equal in all respects to the one from which the first lot of sections had been made. The dry matter in these sections was determined and the increase noted. It is concluded that under favorable weather conditions an increase in weight of the dry matter of more than 15 per cent in the course of a forenoon indicates good growth, an increase of 10 to 15 per cent, medium, and from 5 to 10 per cent, poor growth, while an increase of only 5 per cent may be regarded as practically a stagnation in growth.

Observations with reference to the transpiration of water by the cane plant showed that the quantity was approximately 5 liters per day. Experiments on the respiration of the plant were made and the daily quantity of carbon dioxid formed and glucose consumed in different varieties is given.

Cuttings of 4 or 5 internodes are recommended for planting.

Experiments in growing tobacco of the Sumatra type under shade, E. H. Jenkins (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 446, 447*).—It was found that mosquito netting as a covering for the growing crop was as durable as cheese cloth and shaded the plants to a much less extent. The author does not consider shade at all necessary in that latitude, and believes the value of shade to lie in the protection from insects, high winds, hail, and drought, and in providing a higher and more equable temperature and a damper atmosphere.

Owing to an unsatisfactory growth of part of the crop an intended comparison of curing on the stalk and curing the primed leaves became impossible. The pole-cured crop of this season was about 250 lbs. less than the pole-cured crop of 1901 and also inferior to it in quality. The finished crop of 1901 was sold at an average price of $1.59 per pound.

Preliminary report on fertilizer experiments with tobacco at the Deli Experimental Fields in 1902, D. J. Hissink (*Meded. 'S Lands Plantentuin, 1903, No. 62, pt. 3, pp. 68*).—The plan and purpose of the experiments on the different fields are described, and data with reference to planting, cultivating, and harvesting the crop, together with meteorological records, are presented.

Influence of climate and soil on the composition and milling qualities of winter wheat, A. M. Soule and P. O. Vanatter (*Tennessee Sta. Bul. Vol. XVI, No. 4, pp. 51–88, figs. 22*).—The experiment here reported is cooperative between the station and the Bureau of Plant Industry of this Department. Former results of similar work have been previously noted (E. S. R., 13, p. 546).

Of 48 varieties of wheat tested for several years, not more than 6 are considered first class. The results for the 6 leading varieties are summarized in the following table:

Results with varieties of winter wheat.

Name of variety.	Yield per acre, 1903. Grain.	Yield per acre, 1903. Straw.	Average yield of grain for 4 years.	Number of grains per ounce of seed used in 1903.	In crop of 1903: Av. number of grains— Per head.	In crop of 1903: Av. number of grains— Per ounce.	Average weight of grain per bushel for 4 years.	Relative hardness for 3 years.	Protein, average for 4 years.
	Bu.	*Tons.*	*Bu.*				*Lbs.*		*Per ct.*
Poole	48.54	3.77	37.23	776	19.58	965	58.56	72	15.43
Improved Poole	47.60	3.42	37.21	759	21.09	888	58.56	71	15.22
Niger	44.27	3.09	36.77	619	19.01	736	59.00	127	15.20
Imp. Fulcaster	45.21	3.69	36.56	764	20.00	914	59.00	106	16.01
Fulcaster	39.27	3.06	36.25	693	19.02	772	59.76	138	17.06
Mediterranean	42.55	3.18	36.18	715	19.33	821	59.91	124	17.39

These varieties ripened June 10 and 11. Poole is the only variety brought into the State which is recommended for general culture. The yield of straw in 1903 was heavy, and the varieties given above were among the heaviest producers, Poole leading all varieties. The lowest average yield of the varieties tested for 4 years was 24.11 bu. per acre. Some of the reasons given for low yields in the State are disregard of rotation, improper preparation of the seed bed, deficiency of vegetable material in the soil, late seeding, and growing unsuitable varieties.

The number of grains per ounce in the varieties tested varied from 589 for Red Cross to 1,068 for No. 5342, a foreign variety furnished by this Department. The average number of grains per head ranged from 15.58 in Velvet Chaff to 34.86 in Mealey. This last mentioned variety contained 1,016 grains per ounce, and ranked first in relative hardness.

The protein content of the varieties was high, the lowest, 13.19 per cent, being found in Dawson Golden Chaff. The influence of the season on the protein content is shown by the fact that Wood Hybrid, one of many examples, contained 21.92, 13.77, 15.74, and 15 per cent in 1900, 1901, 1902, and 1903, respectively. The protein was highest when the rainfall was somewhat deficient during the ripening period, but it was not materially affected by fertilizer or soil treatment.

The relative values of these varieties of winter wheat for the production of flour and bread were determined and compared with those of standard wheats grown in Kentucky, Ohio, Oklahoma, Minnesota, and Ontario. The percentage of flour was found to be high in Tennessee wheat. Fulcaster ranged in this respect from 70 to 75 per cent and averaged 73.4 per cent. There was considerable variation in the different wheats, but leading varieties from other sections of the country were not reduced in flour content when grown in Tennessee, and some of the varieties regarded as inferior for the State were as high in flour content as the leading varieties.

The ash content of the Tennessee samples, although showing wide differences, did not vary more than in the other samples, and is regarded in general as being very high. The Tennessee wheat also showed a very satisfactory gluten content, being below 10 per cent in only 2 instances, generally over 11 per cent, and in a large number of cases over 13 per cent. Fulcaster and Mediterranean stood high in this particular, as did also Kansas Mortgage Lifter, Blue Straw Fultz, Perfection, Early Ripe, Rice Wheat, and others. The leading Tennessee varieties yielded as much gluten as Turkey Red or the Minnesota hard spring wheats, and much more than the soft wheats, such as Early Genesee Giant and Dawson Golded Chaff. The absorptive capacity of the Tennessee flours was equal or superior to that of standard varieties grown in other sections of the country. In Fulcaster the absorptive capacity ranged from 60 to 62, and in Poole and Mediterranean it also ranked well. The

Tennessee hard wheats, as Fulcaster and Mediterranean, did not class as high in color as early Genesee Giant, Dawson Golden Chaff, Winter King, and Poole, but these softer varieties can be satisfactorily produced in the State. The milling and baking tests were also favorable to the varieties produced in Tennessee, and the number of loaves obtained per barrel of flour equaled or exceeded the number obtained from wheats grown in other States.

The seed selection carried on with Fulcaster, Mediterranean, and Poole is described, and the results obtained with Mediterranean for 3 years are tabulated. Large grains from medium heads gave the best average yield—32.68 bu. per acre. Large grains from large heads stood second, with an average yield of 32.37 bu. It is stated that selections from medium sized heads are most likely to give satisfactory results. The large grains have always given the best average yields. It is believed that the standard of a variety may be maintained, and that it may be adapted to local conditions, by carefully grading the seed selected from the best type heads in the field. In order to show results selection from type heads should be carried on systematically through a series of years.

The use of commercial fertilizers and barnyard manure on impoverished soil after bare fallow was not profitable. The cost per bushel of increase in 1902 was lowest with barnyard manure, and in this case it amounted to 56 cts. per bushel. In 1903 a mixture of 50 lbs. nitrate of soda, 100 lbs. acid phosphate, and 25 lbs. of muriate of potash per acre produced the most profitable increase, at a cost of 50 cts. per bushel. Lime showed a loss in 1902, but in 1903 gave an economical gain, the cost per bushel of increase being about 11 cts. For the 2 years barnyard manure gave the largest increase of gain at the least cost—55 cts. per bushel. The same fertilizer applications were tested on an impoverished soil after a crop of cowpeas had been turned under. The increase with this treatment varied on an average for the 2 seasons from 5.31 to 11.43 bu. of wheat per acre. The plowing under of cowpeas and the liberal application of phosphates, potash, and lime are recommended for impoverished soils.

Soil treatment for wheat in rotations, with special reference to southern Illinois soils, C. G. Hopkins (*Illinois Sta. Bul. 88, pp. 113–143, figs. 8*).—Cooperative rotation experiments have been in progress for 2 years at Vienna, Odin, Cutler, and Mascoutah, in southern Illinois, and the results thus far obtained are reported. The plan of the experiment is as follows: First year, corn or wheat with a leguminous catch crop on certain plats; second year, oats with a leguminous catch crop on the same plats as in the first year; third year, clover, cowpeas, or some other leguminous crop.

All leguminous catch crops are plowed under for the benefit of the land. The quantity of lime applied is governed by the need of the soil, as indicated by a determination of its acidity. Phosphoric acid is given in applications of 400 lbs. of fine-ground steamed bone per acre the first year, and of 200 lbs. each year thereafter, and potash in applications of 200 lbs. per acre of potassium chlorid or potassium sulphate the first year and afterwards 100 lbs. annually. The fertilizers are not applied uniformly to all plats, but only to certain ones. Barnyard manure is used alone and in combination on some plats, and is applied only once in a rotation at the rate of 2 tons per acre.

The results obtained on each experimental field are shown in tables and discussed. Owing to the very uniform soil on the Cutler experiment field, the results there obtained are taken as the basis for a general discussion of the effects of the soil treatment.

Making allowance for the value of the fertilizing materials removed by the wheat crop, a plat on which leguminous crops were plowed under gave a net return of $1.42 per acre of wheat, while the check plat gave $0.88. The results of 2 other plats indicated that the omission of this treatment with luguminous crops had reduced

the profits by $1.73, even after allowing $1 for the expense of growing and turning under a leguminous crop and disregarding its residual effect. The plat receiving barnyard manure gave a return of $3.57, against $0.88 with no fertilizer of any kind. Moderate applications of ground limestone to acid soils gave a marked improvement in the growth of leguminous crops, but the full extent of this improvement has not yet been determined. The application of phosphoric acid proved a very profitable treatment for this soil. Lime and a leguminous crop turned under gave a return of $2.73, and the addition of phosphoric acid apparently increased this return to $7.30 per acre; and the returns with manure ($3.39) were apparently increased to $8.30 by the addition of phosphates. Potash also proved profitable, especially when used with a leguminous crop and phosphoric acid, the profit of $7.30 an acre noted above being brought up to $11.88 where potash was added. The use of potash without phosphoric acid is considered unprofitable on nearly all Illinois soils, the swampy soils excepted, since with the exception of swampy and sandy lands, the subsoils contain large supplies of potash, and attention is called to the probability of making these stores more available to growing crops by tile drainage.

The effect of tile drainage was observed on the Odin experiment field. In 1902 2 plats, one of which was tile-drained, were treated with a leguminous crop, lime, and phosphoric acid. The yield of oats on the tile-drained plat was 19.2 bu. per acre, and on the other, 16.7 bu. In 1903 the tiled plat yielded 13.4 bu. of wheat per acre, and the untiled plat 5.8 bu. An untiled plat treated in all respects the same as the foregoing, and receiving in addition an application of potash, yielded 14 bu. of wheat per acre, while on the tiled land the increase in favor of the potash plat was only from 13.4 to 15.2 bu. Comparing 2 plats on the tiled land, the use of potash appears to have reduced the yield of oats by 1.5 bu. The beneficial effect of mulching land with wheat straw, which was incidentally observed, is briefly noted.

The structure and color of wheat kernels, W. von Gromann and F. Schindler (*Fühling's Landw. Ztg., 52 (1903), No. 4, pp. 117-121*).—Microscopical examinations were made to determine the possibility of differentiating varieties of wheat by the internal structure of the kernel, and to determine whether widely different climatic conditions influenced the color and thickness of the pericarp, and whether the color of the grain is due to any extent to the outer layer.

No regular and well-defined differences in the internal structure of the kernel of wheat varieties was discernible. The pericarp of *Triticum spelta*, *T. dicoccum*, and *T. monococcum* differentiated itself from the pericarp of the naked wheats by its weaker development. Wheats from various countries were also studied, but no regular structural differences were observed which might be attributed to climatic conditions. The authors believe, however, that the climate may effect the structure of the pericarp and that, to demonstrate this point definitely, kernels varying practically only with reference to the climatic conditions under which they were produced should be obtained.

It was found that the color of the pericarp of different varieties of wheat is uniform and the conclusion is drawn that for this reason the difference in color of wheats must be due to the color of the seed coat. The outer layer of the seed coat is colorless, while the color of the inner layer accords with the color of the grain.

Reports on the investigation of Russian wheat, I. D. Kolesnikov, A. I. Kovenko, and P. B. Budrin (*Trudi Syez. Dyeyat. Selsk. Khoz. Opuitn. Dyela, 1901, pp. 109-124; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 4, pp. 486, 487*).—Attention is called to the fact that the varieties of Russian wheat on the market are little known, and that there is neither a correct botanical description of them nor an established nomenclature. The establishment of at least one special station in Russia for the investigation of agricultural plants is recommended.—P. FIREMAN.

HORTICULTURE.

The relation between hybrid characters and those of their parents, H. De Vries (*Rev. Gén. Bot., 15 (1903), No. 174, pp. 241–252*).—The laws governing the production of hybrids are stated by the author as follows: (1) Crosses between forms corresponding to elementary or progressive species give constant hybrids. Some common examples are *Ægilops speltæformis* (*Æ. ovata* X *Triticum vulgare*) and *Medicago media* (*M. falcata* X *sativa*). (2) Crosses between forms corresponding to properly called varieties, retrogressive or "degressive," give hybrids whose offspring separate according to the law discovered by Mendel for peas. (3) When the difference between the 2 parents of a hybrid is in part of a progressive nature and for the other characters of a retrogressive or "degressive" nature, the offspring of the hybrid does not change for the first, but separates according to the latter.

The author states that the first 2 cases are simple, but relatively rare. The third is the ordinary case for the large majority of crosses made by different investigators. A number of examples are cited under the different laws.

As explanatory of the words "progressive" and "retrogressive," the author notes that when new characters are being acquired by an individual this constitutes a "progressive" mutation. Once acquired, however, a character may not always remain visible in the development of an individual. While not apparent it may be present in a latent state. This the author calls a "retrogressive" mutation.

The forward movement in plant breeding, L. H. Bailey (*Proc. Amer. Phil. Soc., 42 (1903), No. 172, pp. 54–68*).—This is a comprehensive review of the work in plant breeding now being carried on in America. It deals with the methods, ideals sought for, and results obtained. The work with corn in Illinois and wheat in Minnesota is noted in considerable detail.

Forcing rhubarb in the dark, V. H. Davis (*Jour. Columbus Hort. Soc., 18 (1903), No. 3, pp. 86–91, figs. 3*).—The details and results secured in winter forcing seedling rhubarb roots are recorded. Usually only crowns from 3 to 5 years old are used for winter forcing. In the present experiment seedlings obtained by sowing seed in April in drills 24 in. apart were used. The seedlings made a remarkably good growth during the summer, many leaves attaining a foot across, with stalks 15 to 20 in. long and an inch thick.

After the ground had been frozen and thawed out once in the fall the roots were plowed out and placed in a dark cellar. They were packed closely together, with the crowns up and soil sifted between until the roots were covered 2 or 3 in. deep. They were then thoroughly soaked with water and the room made perfectly dark. The stalks pushed rapidly into growth, and within 4 weeks an excellent growth of rhubarb was secured. These seedling roots furnished 2 pullings of first-class stalks, 2 more of fair stalks, and 2 or 3 more small pullings of rather small and spindly stalks.

In all, the one crop lasted about 4 weeks. The exhausted roots were then removed and a new supply grown in like manner. It is stated that in this work the temperature should never be allowed to go above 60° F., unless quick results are wanted at the expense of quality and quantity. The crop grown in this experiment sold for from 60 to 75 cts. per dozen bunches, and there were from 4 to 6 stalks in each bunch. From an area of 870 sq. ft. of cellar space rhubarb to the amount of $35.55 was sold, and it is believed that the yield obtained in this experiment can be materially increased when more attention is given to the growing of the seedlings.

Special mention is made of the desirability of growing the roots in absolute darkness, since by this method the strength of the root is directed into the stem of the rhubarb rather than into the production of foliage. "By planting the seed on

heavily manured loam soil and thinning the plants to a distance of 1 ft. in the rows, with proper cultivation and mulching if need be, we believe roots can be grown in a single season which will give twice the yield received from our experiment. If it can be done with certainty from year to year the question of obtaining crowns for forcing purposes will be solved."

Storing and forcing of chicory, H. W. WARD (*Gard. Chron., 3. ser., 34 (1903), No. 879, pp. 299, 300*).—In blanching chicory the author states that as soon as the plants die down in the fall he finds it advisable to sprinkle a small quantity of wood-ashes around and over them. Troughs about 10 in. deep, 9 in. wide, and 8 ft. long are placed over the rows and covered with a quantity of clean, and slightly fermenting leaves to a depth of 2 ft. When thus handled it is claimed that well-blanched chicory may be cut within 2 or 3 weeks. It has been found desirable to blanch contiguous parts of 6 or more rows at one time, as a better and more even degree of heat is secured from the leaf bed by this method. As the season advances and the weather becomes warmer the depth of the leaf bed should be reduced.

Where this method cannot be followed, successive batches of roots may be taken up and placed 3 or 4 in. apart in shallow boxes or pots, with light mold packed moderately firm about them, and placed in a dark frost-proof cellar, cave, or shed. When thus forced in boxes they should also be covered over with boxes at least 8 in. deep.

Results of variety tests of vegetables during the last 5 years, E. JUNGE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 125, 126*).—The best varieties grown in the gardens of the horticultural school at Geisenheim for 5 years are enumerated for a large number of different kinds of vegetables.

The white truffle mycelium, E. BOULANGER (*Les mycelium truffiers blancs. Paris: Oberthur, 1903, pp. 23, pls. 3*).—A technical botanical description is given of truffle mycelium, with microscopic drawings showing the development of different stages of the mycelium. The gist of this paper has been noted from another source (E. S. R., 15, p. 253), as has also a paper on the artificial culture of truffles, by L. Matruchot (E. S. R., 15, p. 253), which is included in the article.

Systematic pomology, F. A. WAUGH (*New York: Orange Judd Co., 1903, pp. 288, figs. 35*).—This is a text-book on systematic pomology. It treats of the description, nomenclature, and classification of fruits, including the usual orchard fruits, small fruits, and grapes. The blank forms used in describing and classifying fruits at a number of agricultural colleges and experiment stations and at this Department are reproduced.

The book contains exercises in fruit nomenclature, classification, and description, as well as others in judging fruits. Blank score cards are given for judging all the more usual fruits seen at fairs and horticultural exhibitions. The book concludes with a glossary of the terms used in systematic pomology, and an index. The work as a whole deals with methods and principles, and therein differs from the books on systematic pomology thus far published in the United States, which confine themselves more closely to detailed descriptions of varieties, etc. It will, undoubtedly, prove of much usefulness as a text-book in agricultural schools and colleges, and as a guide to judges at fruit fairs and exhibitions.

The fruit census of Connecticut, E. H. JENKINS, W. E. BRITTON, and B. H. WALDEN (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 432-443*).—The statistics secured in a careful canvass of the State by agents and through a circular request for information are tabulated for orchard and small fruits grown in each of the different counties of the State. Apples are the leading fruit, the total acreage being 4,717.25. Peaches follow, with 3,616 acres; and then strawberries, with 445.67 acres. Next in importance stand Japanese plums, with a total of 262.8 acres. Commercial peach growing is shown to have developed rapidly during the past 10 years, the total area

devoted to peaches in 1892 being 730 acres with a yield of 40,603 bu., as compared with an area of 3,616 acres and a yield of 312,174 bu. in 1902.

Report of the fruit experiment stations of Ontario, L. WOLVERTON ET AL. (*Ontario Fruit Expt. Stas. Rpt. 1902, pp. 104, map 1, figs. 36*).—A further report is given on the success or failure of the orchard and small fruits grown at each of the 15 experiment fruit farms in Ontario. Descriptions and full-sized illustrations are given for purpose of identification of several varieties of apples, blackberries, cherries, grapes, peaches, pears, plums, and strawberries. The report also contains a catalogue which shows in tabular form the values of the different varieties of orchard and small fruits grown in Ontario, and their adaptability to the various parts of the Province. The plan of the report is similar to those previously noted (E. S. R., 14, p. 41). Japanese plums have proved very successful as far north as Georgian Bay.

Special methods of cultivation for special conditions, W. T. MACOUN (*Ontario Fruit Growers' Assoc. Rpt. 1902, pp. 56–59*).—Notes are given on the good results secured in the vicinity of Montreal by growing orchards in sod. This practice is considered very desirable in young bearing orchards in that vicinity, where winter-killing of the roots is extremely likely unless protected by grass, sod, or some clover crop. Some data are given on the yields and profits obtained in planting Wealthy apple trees 10 ft. apart each way. For the 4 years, 1899 to 1902, the total receipts per acre were $940.15 and the expenses $454.62, leaving a net profit of $485.53, or an average profit of $121.38 per year from this method of growing Wealthy trees.

An experiment in planting fruit trees too deep (*Ber. K. Lehranst. Wien, Obst u. Gartenbau, Geisenheim, 1902, pp. 83–88, figs. 3*).—A number of different kinds of fruit trees were set out to a normal depth; others were planted 10, 15, 20, 30, and 40 cm. deeper than the normal, to see what effect this would have on the root development of the trees. In general the size of the tree and the extent of the root development decreased with every increase in depth of planting beyond the normal.

Apples and apple growing in Minnesota, S. B. GREEN (*Minnesota Sta. Bul. 83, pp. 31, pls. 49, figs. 7*).—Popular directions are given for the culture of apples in Minnesota, including details as to methods of planting, protection of the trees from sun scald, manuring, cultivation, and selection of hardy stocks, and descriptions of 67 varieties grown in the State. Half-tone illustrations are given of the whole and halved apples of 55 varieties.

The most successful varieties grown in Minnesota consist of a few Russian varieties and seedlings of local origin. Some of the varieties recommended for planting are as follows: Of the first degree of hardiness—Duchess, Hibernal, Charlamoff, and Patten Greening, and of the second degree—Wealthy, Longfield, Tetofsky, Malinda, Okabena, and Peerless. The crabs and hybrids recommended for general cultivation are Virginia, Martha, Whitney, Early Strawberry, Minnesota, Sweet Russet, Gideon No. 6, Briar Sweet, Florence, and Transcendent.

While seedlings of *Pyrus baccata* have proved most resistant to root killing they are not entirely adapted to all varieties of cultivated apples. Hybrid crabs at present form the most promising source for hardy stock. For the severest locations in Minnesota and Manitoba it is believed to be a good plan to grow only hybrid crabs and have them grafted on pure *Pyrus baccata*. Root-grafted trees are believed to be more hardy than top-grafted.

In light, dry soils it is recommended that the trees be planted 12 in. deeper than they naturally grow in the nursery. On steep hillsides they should be planted deeper yet, in some instances being set as deep as 20 in. or more, for the purpose of affording

protection to the roots. The author recommends that the orchard be plowed late in the autumn to act as a winter mulch. On steep hillsides where cultivation is not possible the orchard should be mowed and the grass piled around the trunks. When the snow is not over 6 in. deep it is recommended that in addition to late plowing the trees be mulched with coarse manure or litter for a distance of 3 to 6 ft. from the trunk.

Thinning apples, S. A. BEACH (*New York State Sta. Bul. 239, pp. 197–224, pls. 2*).—Experiments were made by the author covering a period of 4 years in thinning apples, to determine the effect of thinning on size, color, quality, and yield of fruit; the amount of the different grades of fruit; the influence of thinning in promoting regular annual bearing; and finally the cost and profitableness of thinning apples.

The varieties of apples under observation were Baldwin, Hubbardston, Nonesuch, and Rhode Island Greening. Three methods of thinning were practiced. By the first method all wormy, knotty, or otherwise undesirable fruits were removed and each cluster thinned to 1 fruit. The second and third methods were similar to the first, except that the fruits were thinned to not less than 4 and 6 in. apart respectively. The data obtained in the experiments are given quite fully in tabular form and discussed.

In seasons of heavy crops, thinning was found to heighten the color of both yellow and red fruits and to increase the size of the fruit. When only a small crop was set thinning had no appreciable influence on either color or size. With Rhode Island Greening, which has a tendency to bear more regularly and produce smaller crops, the effect of thinning was less noticeable than with Baldwin and Hubbardston. As to the influence of thinning on the regularity of bearing, the experiments with all 3 varieties are fairly uniform in showing no material change in either the amount of fruit grown or the regularity of its production by thinning.

Data sufficient to furnish a basis for specific directions as to distances apart to thin apples were not obtained in this experiment. This is a matter that depends upon the amount of fruit that sets, its distribution on the tree, and the ability of the individual tree to bring fruit to perfection. Supplementary evidence covering a period of 10 years and tending to show the variability in productiveness of trees of the same variety from year to year are given for several Rhode Island Greening trees. The data bring out the fact that some trees regularly produce year after year heavier crops than others.

Where thinning is practiced the author advises that the work be begun within 3 or 4 weeks after the fruit sets, even if the June drop is not yet over. In these experiments the time required for thinning and harvesting the apples on the thinned trees was about twice as great as the time required for harvesting the fruit from the unthinned trees. It is believed that the cost of thinning a well-loaded apple tree should not exceed 50 cts.

As to the market value and profitableness of thinning, the experiments show that the thinned trees bear a larger percentage of first-grade fruit than unthinned trees, and that the fruit is much better adapted for making fancy grades. When this fancy fruit can be marketed in boxes or barrels in quantity buyers are likely to give a higher price for it. The opinion of a practical grower, in whose orchard the experiments were conducted, is to the effect that when there is a heavy set of apples and the likelihood of a large crop of small fruit general, it will pay to thin to such an extent as to insure good-sized fruit; otherwise not, except as a protection to the tree.

Should apples be thinned? F. H. HALL and S. A. BEACH (*New York State Sta. Bul. 239, popular ed., pp. 10*).—A popular summary of the above bulletin.

The effect of grass on [apple] trees, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt. 1903, pp. 56, pls. 3*).—Some data showing the injurious effects of grass on the growth of fruit trees were reported by the authors 3 years

ago (E. S. R., 12, p. 749). The present pamphlet gives the details of investigations made to determine why grass has such a serious effect on the development of apple trees.

Experiments have been made with both dwarf and standard trees. The details of the experiments reported by the authors clearly indicate that the injurious action of grass is not due to its harmful effects in absorbing or evaporating the moisture of the soil about the trees, nor of removing the plant food from the soil, nor of interfering with the air supply in the soil. On the other hand, it is thought probable that it may be attributed to the action of some product, direct or indirect, of grass growth which exercises an actively poisonous effect on the roots of the trees.

Data are given which show that the temperature of the soil on bright days in summer, 6 in. below the surface in land covered with grass, is quite uniformly about 3 degrees lower than in cultivated soils. This, however, is not considered an item of importance, since the average soil temperatue of one summer often differs by more than this from that of another without producing any of the injurious effects caused by grass on trees.

Orchards in grass not only made a very much smaller growth, but also blossomed earlier in the spring and the leaves yellowed up and dropped much earlier in the autumn than with cultivated trees. Calculating the growth of trees in cultivated ground as 100, trees in grass have made a growth in the case of Bramley of 50 per cent, Cox 33 per cent, and Potts 41 per cent. When weeds have been allowed to grow Bramley made an average growth of 66 per cent, Cox 52 per cent, and Potts 73 per cent. It is thus seen that weeds are not nearly as harmful in orchards as grass.

Cold storage of apples, H. C. Price (*Iowa Sta. Bul. 72, pp. 31–44, dgms. 2*).—This bulletin contains a discussion of the present status of apple growing in Iowa, the importance of cold storage of apples to the State, directions for handling the apple crop, and the results of a test of the keeping qualities of 15 standard varieties of apples grown in the State.

The author states that but few late varieties do well in the State, consequently the market season of Iowa apples is comparatively short, the bulk of the crop being marketed during November and December. The abundance of apples on the market at this time is a little later followed by a dearth which must be supplied by importation from other States. It is believed that this condition might be changed if the surplus crop harvested in the fall could be kept in cold storage until such time as needed later in the winter.

Experiments were therefore made to test the keeping qualities of some of the varieties commonly grown in the State. A number of barrels of each of 15 varieties were stored in September and October, and examined at intervals of a month during the winter until April 14. The amount of decayed and sound fruit found in the barrels of the different varieties at each inspection is given in tabular form.

The data show that McMahon White, Northern Spy, Pewaukee, Roman Stem, Seek-No-Further, White Pippin, and Wolf River all possess poor keeping qualities and are not considered suitable for storing. On the other hand, such varieties as Ben Davis, Domine or Wells, Janet, Romanite, Willow Twig, Fameuse, and Wealthy kept especially well. Especially satisfactory results were secured with Fameuse and Wealthy, both of which kept well until March. The results with Wealthy and Fameuse are believed to be of great value to the apple growers of the State, since these varieties are hardy throughout the State, productive, and of excellent quality.

Observations on the fertilization of peach orchards, E. H. Jenkins (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 443–445*).—The data secured in 1902 are added to those reported in previous years (E. S. R., 14, p. 354) on the yields of peaches obtained on plats differently fertilized. Each plat contains 48 trees, which are replaced as

they die. The average number of baskets of peaches secured from each tree on the differently fertilized plats for the years 1899 to 1902 is shown in the subjoined table:

Yield of peaches on plats differently fertilized.

Plats.	Fertilizers applied.	1899.	1900.	1901.	1902.	Average.
		Baskets.	*Baskets.*	*Baskets.*	*Baskets.*	*Baskets.*
A	65 lbs. muriate of potash, 160 lbs. acid phosphate	3.2	5.6	3.3	1.6	3.4
B	65 lbs. muriate of potash, 160 lbs. acid phosphate, and 170 lbs. cotton-seed meal.	3.8	6.3	3.3	3.6	4.3
C	65 lbs. muriate of potash, 160 lbs. acid phosphate	3.5	5.2	2.8	2.1	3.4
D	130 lbs. muriate of potash, 160 lbs. acid phosphate	4.1	5.8	3.6	2.2	3.9
E	260 lbs. muriate of potash, 160 lbs. acid phosphate	4.3	6.3	4.2	3.8	4.6
F	260 lbs. high-grade sulphate of potash, 160 lbs. acid phosphate	4.7	6.1	4.6	2.3	4.4

Peach-bud dropping, G. Abbey, Jr. (*Gard. Chron., 3. ser., 34 (1903), No. 879, pp. 307, 308*).—The author calls attention to the statement in The Book of the Peach (E. S. R., 15, p. 363) that peach-bud dropping is due primarily to looseness of soil, absence of lime, and want of water at the roots, and gives the results of some personal experiments in which peach-bud dropping was found to be due to "the premature development of the buds, caused by the necessary closing of the ventilators on account of plants being put in when the peach house should have been kept cool and open."

Reports of experimental shipments of pears and peaches (*Canad. Hort., 26 (1903), No. 11, pp. 453–455*).—An account is given of a shipment of a carload of Bartlett pears from Grimsby, Canada, to Glasgow, Scotland. The pears were picked perfectly green and packed without wrapping in half cases with excelsior padding. They were carried across the ocean at a temperature of 44 to 46° F., as a result of which 71 cases arrived over-ripe and had to be thrown out. The remaining pears sold for from 30 cts. for 20 lbs. to $3.47 for a 40-lb. box, and averaged for the whole lot about $1 net per box. Fifteen half boxes of peaches shipped at the same time under like conditions were wholly decayed upon arrival. With suitable ocean storage it is believed this trade could be made very profitable.

Plum culture and district lists of plums suitable for Ontario and Quebec, with descriptions of varieties, W. T. Macoun (*Canada Cent. Expt. Farm Bul. 43, pp. 54, pls. 2, figs. 4*).—This is a popular bulletin on plum culture, dealing with methods of propagation, preparation of the soil, and particulars as to planting and subsequent care of the trees. Lists are given of varieties most suitable for the different fruit districts in the provinces of Ontario and Quebec, and descriptions given of 38 American, 34 European, and 4 Japanese sorts.

A popular paper on Fertilizers for the Plum Orchard, by F. T. Shutt, is included in the bulletin, and another of like nature on Plum Insects, by J. Fletcher. Notes are also given on canning and preserving American plums, and a number of the formulas that have been found useful in station experience are given. With American varieties of plums it has been found desirable in nearly every case to peel the fruit before preserving. The Bixby variety was the best of those tested cooked with the skin on. The usual diseases affecting plums are described and remedies suggested.

The truth about the strawberry-raspberry (*Rubus illecebrosus*), A. Rehder (*Amer. Gard., 24 (1903), No. 457, p. 603, fig. 1*).—According to the author this plant was introduced into America from Japan about 1895, and probably takes its name from the shape of the fruit. It is not a cross between the strawberry and raspberry. It differs from the Indian raspberry (*Rubus rosæfolius*), by which name it has been

sometimes called, in a number of details. The fruit is very attractive in appearance, and while rather insipid is considered by the author very agreeable when made into jam or preserves. It grows readily in most any soil in the Northern States, and is not easily eradicated. The article contains a botanical description of the fruit.

Cranberries in West Virginia, L. C. CORBETT (*West Virginia Sta. Bul. 86, pp. 115–126, pls. 4*).—This bulletin contains directions for the propagation and culture of cranberries, with an account of successful experiments inaugurated by the author in cranberry growing in some of the mountain glade lands of West Virginia.

The experiments were begun in 1894. At the present time a number of plats have been thoroughly established. The berries produced are of large size and superior color. The yields obtained varied from 84 to 160 bu. per acre. Six varieties are described, including the native sorts. The experiments thus far have taught the necessity of stripping all sod and vegetation from the area to be planted and putting on a coating of at least 4 to 6 in. of sand free from clay or the seeds of persistent weeds. Flooding does not appear to be necessary on the plats under observation.

Report of the experimental vineyard at the Ploti Experiment Station (*Rap. An. Sta. Expt. Agron. Ploty, 8 (1902), pp. 126–133*).—An account is given of the yield, sugar, and acid content of grapes when fertilized with a number of different fertilizers. Phenological notes are included on a number of varieties of European grapes.

Fertilizing grapes with nitrate of soda (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 15, 16*).—In an experiment in which about 160 lbs. of nitrate of soda was used per acre in 3 separate applications, it was observed that the wood growth was much heavier than where the nitrate of soda was omitted, and the development and yield of grapes was most satisfactory. The nitrate of soda was most effective with the variety Elbling, followed by Sylvaner. It was least effective with the Reisling variety, the effect on this variety being only about one-third as great as with the Elbling.

Influence of the method of storing grape cuttings in winter on the rooting of the same, GOETHE and ZEISSIG (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 56–58, fig. 1*).—In this experiment 4 bundles of grape cuttings were used. One bundle was placed, immediately after being made, in dust, another in sand, a third half in sand, and a fourth was left standing free. All were kept in a cellar. The following spring they were planted out in a nursery. The strongest growth was made by the cuttings preserved in the dust, followed by those wholly in sand, and then by those half in sand. Those left standing in the open in the cellar gave the poorest results of all, only about a fifth as much growth being obtained as where the cuttings were preserved in dust.

Investigations on the process of ripening of one-year-old grape wood, ZEISSIG (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 59–64, fig. 1*).—The changes in the physical structure which occur in the ripening of one-year-old grape wood were investigated. The wood was examined at intervals between August 16 and November 3. It was observed that with the increase in maturity of the wood there was an increase in the size of the starch grains and in the total quantity of starch stored up, particularly in the bast. The fibrovascular tissue was further developed, the secondary bast fiber and sieve tubes developed in the bast portion, and finally the whole external bark shrank and became separated from the inner tissues by the formation of a periderm.

An examination of a number of shoots, the upper portion of which were more or less unripe, showed that there was a considerable increase in the pith from the ripe portion of the shoots upward, and a corresponding decrease in the wood and bast tissue in which the reserve material is stored up. This fact is believed to account for the greater suitability of ripe shoots for cuttings over immature shoots.

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The periderm often failed to develop in the unripe portion of the shoots. The periderm was found essential to the protection of the shoots over winter. Whenever it failed the shoots died, whether they contained starch or not. Poorly ripened wood having an imperfect periderm may withstand mild winters, but not a rigorous one. The secondary bast tissue appeared to play no important rôle in the wood-ripening process. Starch, on the other hand, appeared as the factor of importance in determining the quality of the ripe wood. The periderm was found to develop earlier with grapes grown on a south wall than on a west wall or on the north side of a large post.

The specific gravity of one-year grape shoots and its relation to the ripeness of the wood, ZEISSIG (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 64–68, fig. 1*).—A review is given of the work of Gouin and Andouard, in which it is shown that they found the specific gravity of ripe grape wood lighter than unripe wood. Ravaz and Bonnet, on the other hand, by first eliminating the air from the wood by soaking in water or alcohol, found the ripe wood the heavier.

In the author's investigations along the same lines he found that the specific gravity of grape shoots decreased from the ripe into the unripe wood toward the end of the shoots. This was true, however, only when the whole round cutting was taken. When the shoot was split and the pith removed, then there was but little difference in the specific gravity of the ripe and unripe wood.

Sportiveness of grapevines, J. C. TALLACK (*Gard. Chron., 3. ser., 34 (1903), No. 880, p. 325*).—The author states that of 2 stems taken from a single Muscat of Alexandria vine one stem produced normal Muscat of Alexandria grapes with typical berries, while "the other stem developed into Canon Hall Muscat, with all that variety's characteristics as regards bad setting, form of bunch, and of berry." In another instance a vine of Black Hamburgh produced a bunch with berries double the normal size, and different in form to all the rest of the vine. "The spur which produced this carried 2 laterals, each of which bore a bunch, one being absolutely normal."

Cross-fertilizing experiment with grapes (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 58, 59*).—In some cross-fertilizing experiments with grapes it was found that pollen of several varieties was capable of germinating and fertilizing grape blossoms after being preserved a year. It is noted, however, that the berries obtained from blossoms fertilized with this pollen were poorly developed. Very satisfactory results were secured when the pollen was preserved only a month or so.

Concentrated must from frozen grapes (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1902, pp. 148, 149*).—It is noted that in the season of 1902 a portion of grapes late in the season were frozen on the vines. These were gathered in the morning and quickly pressed before they thawed out; as a result a concentrated must was secured. Analyses are given of this must and of must obtained from the grapes after they had thawed out, a mixture of the 2 musts, and of the must obtained from the second pressing, i. e., after the frozen grapes had been once pressed and then allowed to thaw out and pressed again.

Tea cultivation and curing in India, E. E. OSGOOD (*U. S. Consular Rpts., 73 (1903), No. 278, pp. 554–558*).—This article discusses briefly the methods observed in India in planting, pruning, plucking, withering, rolling, fermenting, sorting, and packing tea.

Report on the cultivation of rubber, cacao, and other agricultural products in Ceylon, W. H. JOHNSON (*London: Waterlow & Sons, Ltd., 1903, pp. 9*).—The author states that Para rubber grows most successfully in Ceylon at about 100 ft. above sea level, where the annual average rainfall is over 100 in. Para trees in Ceylon are ready for tapping after the seventh year from seed. About 1 lb. of rubber is obtained per tree annually.

The trees are tapped by a row of V-shaped incisions made 3 or 4 in. apart and beginning about 6 ft. from the ground. The size of the V's are about 5 or 6 in. long and the open end about 4 in. across. The latex is caught in a small round tin cup, 3 or 4 in. in diameter and about 4 in. deep, and is fixed to the tree by pressing the thin edge of the cup into the bark. The tree is tapped every day until the base is reached, when a second series of similar incisions is begun inside the first series, commencing with the top row. A third, and sometimes a fourth series of inner V's is made, the number depending upon the size of the first incision and the size and age of the tree. Tapping is performed during the early morning and late in the afternoon.

The latex is cured when brought in from the field by pouring into enameled iron saucers about 1 ft. in diameter and 2 in. deep, and left until the rubber coagulates, which usually happens by the following day. If desired it may be hastened by the addition of a few drops of acetic acid; but rubber thus treated is rated at a lower value in the market. The coagulated rubber is pressed out by rolling, after which it is drained and usually submitted to a little artificial heat to hasten drying, and it is then spread out to dry in a well aired room.

Cacao flourishes in Ceylon at all elevations up to 3,000 ft. wherever soil and rainfall are suitable. The 2 varieties of cacao, Forastero and Caracas, which were originally distinct varieties, have become so intermingled by cross fertilization that practically nothing but the hybrid type is now grown. The 2 most serious obstacles to cacao culture in Ceylon are a fungus disease (*Nectria ditissima*) and an insect pest (Helopeltis). The better equipped cacao plantations all have a well equipped drying house fitted with artificial heating apparatus for drying the cacao during wet weather. The drying room is maintained as nearly as possible at a temperature of 110° F. The cacao dried in houses is usually inferior in color to that dried in the sun. The yield per acre was found to vary between 1½ to 4 cwt.

The culture of cocoanuts is steadily increasing, and flourishes up to elevations of nearly 2,000 ft. Specially good results were found to be obtained on one estate by regularly burying all fallen leaves and husks of the nuts around the roots of the trees. In addition, artificial manures were applied at fixed intervals. The trees were planted 26 ft. apart, and the ripe nuts were collected once a month and stacked in heaps in the open air for about a month in order to make them more easy to husk.

Some notes are also given on the culture of cardamoms in Ceylon, and on the Ceylon Botanical Department. The author recommends that the government introduce and cultivate Para rubber in the Gold Coast.

Rubber-tapping experiments at the Botanic Gardens, Singapore (*Queensland Agr. Jour., 13 (1903), No. 3, pp. 269–271*).—An account is given of tapping a number of rubber trees in the Singapore Botanic Gardens, according to the Amazon method. By this method the trees are tapped as high up as a man can reach. A single cut is made with a small axe, the edge of which is an inch or an inch and a half long. A cut is made each day for every 4 in. in diameter of the tree. Thus if the tree is 12 in. in diameter 3 cuts will be made in a day. Every day a fresh cut is made 4 fingers below the cuts of the previous day.

The axe described was found more satisfactory in these experiments than tapping with a chisel and mallet. When the trees were lightly beaten with the mallet in the vicinity of the cut there appeared to be a distinct increase in the flow of the latex. Some data obtained in tapping 100 trees are tabulated which show that the amount of latex obtained from 40 trees with 5 incisions each gave as much latex as 20 trees with 10 incisions or 100 trees with 2 incisions, which shows that each cut gives approximately the same amount and that the return, therefore, depends more on the number of incisions than on the size of the tree.

Sometimes trees which produced but little rubber when first tapped became very

productive after being cut 10 days in succession. After long, dry, hot periods when rains had commenced old wounds which had long ceased to flow frequently broke out again and produced long tears of rubber.

Greenhouses, L. C. Corbett (*West Virginia Sta. Bul. 87, pp. 115–139, pls. 3, figs. 2*).—Notes are given on the comparative durability of greenhouse walls as indicated by station experience, and suggestions given on building greenhouses.

For practical purposes in West Virginia the author considers a 9-in. wall, constructed of brick laid in double courses with about ½ in. air space between the 2 layers, the most satisfactory. The desirability of having space left at the back of benches so that warm air can pass up from below is pointed out. The author's experience with various kinds of metal benches indicates that over a series of years these may be as cheap as wood benches, and are much more satisfactory as regards subirrigation. A 7-ft. bench in the center of the greenhouse was found much more efficient for rose growing when divided into 2 benches each 3 ft. 4 in. wide, with a 4-in. space between the 2 sections. The current of warm air passing up between the benches was very beneficial.

In the author's opinion an ideal ventilator should consist of "two narrow lines of sash, one on either side of the comb and hinged at the bottom of the sash so as to make a broad flue or opening in the top of the house when the ventilators are open." A description is given of a device for fumigating the greenhouse with sulphur. The author discusses the use of large-sized glass and of sash bars in greenhouse construction, and suggests that where 16 by 20 in. or 16 by 24 in. glass is used the sash bars should be 1½ by 3 in., while for glass 14 by 20 in. or less sash bars may be 2¼ by 1½ in., and for 12 by 14 in. glass with bars 12 in. apart a bar 1 by 1¾ in. is considered satisfactory with proper purline supports. Directions are given for laying lapped glass roofs much more rapidly than by the usual methods observed.

FORESTRY.

Sylviculture, A. Fron (*Sylviculture. Paris: J. B. Baillière & Sons, 1903, pp. XII + 563, figs. 55*).—This volume, which is one of a series issued as an agricultural encyclopedia, is designed not only as a handbook on forest culture, but as a source of information on all branches of forestry. The principles of tree growth are discussed, after which the tree as a factor in forestry is considered, and the principal species of forest trees are described, their distribution, habits, and uses being shown.

In practical sylviculture reforestation is discussed at length, various cultural practices being described. The principal types of forests are mentioned, their uses and advantages being pointed out. The concluding portion of the book relates to forests as business enterprises and gives directions for their management, exploitation, estimation of standing timber, valuation tables, etc.

Courses in forestry at agricultural colleges, S. B. Green (*Forestry and Irrig., 9 (1903), No. 11, pp. 552–554*).—The author briefly reviews some of the courses of instruction that should be embraced in or collateral to courses in forestry in agricultural schools.

Second annual report of the forester, W. Mulford (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 468–470, pls. 2*).—In his work on the development of the farm wood lot, the forester reports the experimental work carried on by the station in which 64 experimental plantations are described, as well as cooperative plantings made by 2 private parties and by the city of Middletown on its waterworks property. The treatment of the forest is described and an outline given for the future plantings of this tract.

As State forester, the author reports upon the purchase of 698.5 acres as a site for a State forest, at a cost of $1,110.12. This area has been surveyed and marked, and preliminary investigations begun for its reforestation. The forestry act under which

this work was undertaken has been amended so that the State forester is authorized to make whatever thinnings or changes that are thought necessary in the woodland, and to sell the timber and devote the proceeds to the maintenance and care of the forest.

The Minnesota National Forest Reserve, E. S. Bruce (*Forestry and Irrig., 9 (1903), No. 10, pp. 489–496, figs. 5*).—An account is given of the work done by the Bureau of Forestry in the Minnesota National Forest Reserve, which was established by act of Congress in 1902. Under the conditions of the law establishing this reserve, a tract of land embraced in the northern portion of Minnesota was set aside under conditions of selection and cutting which should be determined by the Bureau of Forestry of this Department.

The Luquillo Forest Reserve, Porto Rico, J. Gifford (*Forestry and Irrig., 9 (1903), No. 11, pp. 537–541, figs. 5*).—A brief report is given by the author of the forest reserve which was established in Porto Rico by presidential proclamation on January 17, 1903. The principal timber trees are enumerated and described and the forest conditions are shown. The object of this reservation is not so much a source of timber as to protect the headwaters of streams that rise in this region.

An ecological study of the Big Spring Prairie, Wyandot County, Ohio, T. A. Bonser (*Ohio State Acad. Sci., Spec. Paper 7, pp. 96, figs. 20, map 1*).—The region included in this study embraces a tract of about 10 square miles, and is located in Wyandot, Seneca, and Hancock counties, Ohio. The various factors which influence the distribution of plants in this region are considered in detail and the various plant associations are described. The investigations included the study of the climatic, physiographic, historical, and ecological factors. The water content and low temperature of the soil is said to account for the distribution of plants, and artificial drainage, where it has been introduced, has shown that by reducing the water level the plant growth is greatly facilitated.

The absence of trees in this region is attributed to the fact that the dense sod tends to prevent the establishment of tree seedlings, and the frequent burnings have caused various reversions in the plant societies. The loose character of the soil does not offer a firm support for tree roots and on considerable areas forest vegetation is entirely lacking. The author believes that by constructing preliminary ditches at intervals of 4 rods, the entire area can be successfully drained and, as shown by limited experiments, this area is well adapted to the successful cultivation of crops.

Forestry at Biltmore, C. A. Schenck (*Forestry and Irrig., 9 (1903), No. 11, pp. 543–547, figs. 2*).—A description is given of the forestry operations which are being carried on upon the Vanderbilt estate at Biltmore, N. C. The forest embraces 125,000 acres in an almost continuous body, and the plans upon which it is being managed are described. It is hoped that the forest will become remunerative within 20 years from the beginning of management, which was in 1896.

An interesting phase of German forestry, A. Cary (*Forestry and Irrig., 9 (1903), No. 11, pp. 554, 555*).—An account is given of the management of the Sulzburg forest of about 5,300 acres. The system under which this is managed will require about 15 years for its development, and at present about 160 cu. ft. per acre are being cut in the forest. The natural regeneration of fir, beech, and oak is taking place rapidly, the fir reproducing very freely.

An average net revenue of $8 an acre has been derived from the forest during the past 5 years, and each adult male inhabitant and each widow receives yearly about $17 in forest revenue, which as a rule more than pays their local taxes. In addition, the town has built various public works, all of which were either paid for outright or were contingent on the income derived from the forest.

Private forestry and taxation, E. Bruncken (*Forestry and Irrig., 9 (1903), No. 10, pp. 509–512*).—The author reviews the present condition of taxation of forest lands, and offers some suggestions which he believes would help forest development.

Possibilities of reforestation in the white pine belt, F. ROTH (*Forestry and Irrig., 9 (1903), No. 10, pp. 505–509, figs. 2*).—A review is given of the condition of portions of the white pine belt of the United States, and suggestions made for its restocking. The author suggests that the States should retain or buy up the lands and make them as productive as possible. Much of the land has no agricultural value and is adapted to forest growth only. In many places simply protecting the growing saplings from fire is all that is necessary to secure restocking. In other cases considerable replanting will be required. Where planting is contemplated it is believed that nurseries should be established on the spot. From these, coniferous plants should be set out at the age of 2 or 3 years. The species recommended for trial include the white, Norway, and jack pines.

Plantations of poplars, P. MOUILLEFERT (*Jour. Agr. Prat., n. ser., 6 (1903), No. 43, pp. 541–543*).—Attention is called to the relative merits of different species of poplar for planting, and a description is given of the Canada poplar (*Populus monilifera*), the Carolina poplar, a form of the Italian poplar known as black poplar or *P. nigra*, the white poplar, quaking aspen, etc. In the selection of these trees for planting, if the plantation is small, the author recommends the choice of trees that have attained a height of about 3 meters. If an extensive plantation is to be made smaller trees should be used, or if proper precautions are taken many of the species will grow readily from cuttings.

The culture of Eucalypts, T. R. SIM (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 14, pp. 505–509*).—Notes are given on the collection and care of Eucalyptus seed and directions for the preparation of the seed bed, the sowing of the seed, care and transplanting of the seedlings, and for the final planting out of the trees. The distance of planting varies with the different varieties and the object for which the plantation is being cultivated, whether for timber, ornament, or other purposes. Notes are given on a few of the more valuable varieties, and their adaptability to South African conditions, their value as timber trees being pointed out.

The timber industry, A. O. GREEN (*Papers and Proc. Roy. Soc. Tasmania, 1902, pp. 35–76, pls. 7*).—A description is given of the timber resources of Tasmania, and an account of the methods of lumbering. The principal species of timber trees which are cut for export, as well as the smaller ones which are used locally, are described. Experiments made to test the transverse strength, deflection, and elasticity of the timber of a number of species of Tasmanian forest trees are reported, and the effect of seasoning and shrinking as shown by different methods of cutting are noted. The report concludes with a list of prices of different forest products and a tabular statement giving the local names, and the botanical and physical characteristics of different trees, together with general remarks as to their use.

SEEDS—WEEDS.

Tests of the vitality of vegetable seeds, E. H. JENKINS (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 424–431*).—In continuation of the tests of the vitality of vegetable seeds a report is given of 199 samples of field and garden seeds which were tested during 1902 at the station. The methods adopted are those hitherto described (E. S. R., 14, p. 364), and the results of the different tests are shown in tabular form.

The investigations begun in 1896 on the effect of the age of seed on the vitality of any seed have been continued, and comparisons made between the vitality of Connecticut and California grown seed. Comparisons are also given of the vitality of onion seed from the crops of 1894 to date, the average for 9 consecutive years being 79.7 per cent. Tests of the sprouting capacity of different varieties have been continued, indicating, as previously reported, the White Portugal to be distinctly inferior in vitality to a number of other varieties.

A botanical study of sugar-beet seed, F. TODARO (*Staz. Sper. Agr. Ital., 36 (1903), No. 6, pp. 449–496*).—Studies are reported on beet sampling for improvement of quality, several methods being described. The influence of size and weight of seed on its vitality; the effect of temperature, moisture, etc., on germination; the stimulating effect of various substances in which the seeds were rolled, and the duration of vitality of beet seed are all reported upon at considerable length.

Report of seed testing at Modena for the year ending December, 1901, F. TODARO (*Staz. Sper. Agr. Ital., 36 (1903), No. 6, pp. 497–512*).—A report is given of the seed testing carried on at the Royal Agricultural Seed Testing Station at Modena in which 2,097 tests are enumerated. These tests were made on 975 different kinds of seed, of which 813 were leguminous forage plants, 37 grasses, 71 cereals, 10 sugar beets, and 31 hemp. The maximum, minimum, and average percentages of germination, purity, and intrinsic worth are given in tabular form, together with the percentage of dodder seed present in the samples. The weed seed found in samples of forage-plant seed and some of the more important species, together with the percentages present, are described.

Report of the seed-control station at Vienna for 1901 (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 338–394*).—A report is given of the routine work carried on at the seed-control station at Vienna, together with investigations at the various substations connected with this institution, for the year ending December, 1901.

During the period covered by this report 26,629 samples of seed and their products were analyzed, and 12,584 lots of seed certified to. Of these, clover, alfalfa, and timothy formed the greater portion. The maximum, minimum, and average germinations of all the different lots of seed tested are reported, comparisons being made with the same factors for the previous year's report. Detailed statements are given regarding the purity, germinative ability, presence of dodder, and special examinations of beet seed, cereals, etc.

Noxious weeds and how to kill them, L. R. WALDRON (*North Dakota Sta. Bul. 56, pp. 201–243, pls. 5, figs. 10*).—This bulletin aims to present in a simple manner information regarding the noxious weeds of North Dakota, and to give suggestions for their eradication. After discussing the effect of weeds in agriculture, the author calls attention to the necessity of being able to recognize the more troublesome species. Methods of eradication are discussed, particular attention being paid to the Russian thistle and the tumbling mustard. Other species of weeds are described, those of special interest being pigeon grass, wild oats, quack grass, wild buckwheat, Russian thistle, tumbling mustard, yellow mustard, French weed, and Canada thistle.

Under the discussion of the Canada thistle a brief account is given of an experiment to test the efficiency of frequent cutting as a means of eradicating this plant. A plat of about 5 sq. rods was cut over at intervals of 4 to 7 days during the season of 1903, and the number of plants counted. During the time covered by the experiment 23 cuttings were made and the number of plants decreased from a maximum of 2,000 to a minimum of 15. Other methods of eradication are discussed.

Some common Ontario weeds, F. C. HARRISON and W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Bul. 128, pp. 96, figs. 43*).—An increasing demand for information regarding the weeds of Ontario has led to the preparation of this bulletin to supplant that issued in 1899 (E. S. R., 12, p. 1052). A number of additional weeds are described, and the methods of eradication are in many instances given in greater detail. More than 60 species of weeds are described, some of them being figured. In addition to describing the weeds, information is given concerning weed seeds, and a number of the more common found mixed with clover and grass seeds are figured and described.

Chrysanthemum leucanthemum and the American white weed, M. L. FERNALD (*Rhodora, 5 (1903), pp. 178–181, figs. 2; abs. in Bot. Centbl., 93 (1903), No. 37, pp. 259, 260*).—According to the author the American white weed, or ox-eye daisy, which is quite common throughout the eastern part of the United States, is not the typical *Chrysanthemum leucanthemum*, but is a form which has long been recognized and for which the name *C. leucanthemum subpinnatifidum* is given.

Poisonous weeds, C. E. BESSEY (*Nebraska Sta. Rpt. 1902, pp. 14–62, figs. 14*).—A special investigation has been inaugurated in the study of the poisonous weeds in Nebraska, the investigation being made possible by an appropriation of the State legislature for the study of poisonous weeds and the causes of disease in horses and cattle. Notes are given on the distribution of the poisonous weeds in general and their classification. The different poisonous or suspected plants are grouped according to the physical characteristics of the localities in which they are usually found, as well as by geographic distribution, following which an annotated list is given of the stock poisoning and suspected plants which have been commonly met with during the progress of the investigation. The list includes only those plants which are known to be poisonous to stock or are strongly suspected of being so.

DISEASES OF PLANTS.

A disease of clover and alfalfa seed, V. PEGLION (*Staz. Sper. Agr. Ital., 36 (1903), No. 3, pp. 198–204*).—A preliminary note is given of a diseased condition of alfalfa and clover seed. The seed appeared to be of an unusual brownish color, and when examined was found deficient either in germination or the subsequent growth of the seedlings. The cause is apparently due to some fungus, although the parasite was not determined. The affected seed can be readily distinguished and the author condemns the use of such seed.

Studies of a root rot of carrots with special reference to its distribution, J. ERIKSSON (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 22–23, pp. 721–738; 24–25, pp. 766–775, pl. 1, figs. 4*).—In the autumn of 1897, on the experimental grounds of the Royal Swedish Agricultural Academy, an apparently new root rot of carrots was noticed. At the time of harvest many of the roots were more or less covered with a mycelium of a reddish violet color. This occurred in felt-like mats, usually present in zonal areas on the roots, the disease sometimes being confined to the upper portions, while at other times only the middle or lower parts of the roots were affected.

A study of the organisms showed that it was *Rhizoctonia violacea* and every variety of carrot examined seemed liable to attack. On the different varieties studied specialized forms of the fungus were discovered and these were found capable of affecting other plants besides carrots. Thus far it has been found possible to inoculate fodder and sugar beets, alfalfa, potatoes, and many weeds, but not red clover nor parsnips. The different plants are affected with varying severity, but beets seem especially subject to injury. The second generation of the fungus grown on beets is much more destructive to beets than the first generation, but the organism seems less able to withstand unfavorable climatic conditions.

Experiments carried on during 1899 and 1900 showed that slaked lime, even when used in considerable quantity, was of little use in combating this fungus. A combination of carbolized lime and "petroleum water" in small quantities proved in some experiments to be valuable in destroying the fungus.

Culture experiments with some rusts of Leguminosæ, E. JORDI (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 24–25, pp. 777–779*).—A preliminary note is given on culture experiments with *Uromyces faba*, *U. ervi*, *U. anthyllidis*, *U. hedysari obscuri*, and *U. astragali*. The experiments showed that these different fungi were specialized upon certain species of plants and could not be inoculated upon others that were more or less distantly related to them.

Some culture experiments with rust fungi on Umbelliferæ, O. Semadeni (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 16–17, pp. 522–524*).—The results of studies of several species of fungi which normally occur in umbelliferous plants are reported. The author found that *Puccinia pimpinellæ*, *P. chærophylli*, and *P. petroselini* were autœcious, while *Æcidium mei*, *P. caribistortæ* and *P. polygoni vivipari* were heterœcious, one phase occurring on species of umbelliferous plants and the other on species of Polygonum.

Club root of cabbages (*Gard. Chron., 3. ser., 34 (1903), No. 878, p. 293*).—According to the writer's observations the club-root fungus remains alive in the soil for a much longer period than has been previously supposed. An account is given of a crop of crucifers on soil that had not carried a similar crop for at least 20 years, having been planted continuously in dahlias, chrysanthemums, and potatoes. The resultant crop was badly infested with club root. Experiments with lime are reported, showing it to be a specific for the prevention of this disease.

Club root of cabbages (*Gard. Chron., 3. ser., 34 (1903), No. 870, p. 163*).—In a brief note the successful use of gas lime for the prevention of club root of cabbages is reported.

A new cucumber disease, M. C. Cooke (*Gard. Chron., 3. ser., 34 (1903), Nos. 867, p. 100; 871, p. 172, fig. 1*).—The author describes a disease of recent appearance on cucumber fruits, in which the fungus forms on the surface of the fruit dark depressed spots, which gradually enlarge and become quite black, cracking either across or around and exposing the paler tissues underneath. The organism has not been definitely determined, but it has been provisionally called *Cladosporium scabies*.

In a subsequent note the author states that the mycelium evidently permeates the entire fruit, and that every fragment of the infected cucumbers should be collected and burned. If spraying should be undertaken, the author believes that Condy's fluid, diluted, would be less liable to injure the fruits than copper fungicides.

A cucumber leaf disease (*Jour. Bd. Agr. [London], 10 (1903), No. 2, pp. 166–170, pl. 1*).—A report is given of the recent observation of a leaf disease of cucumbers, which in general appearances resembles the ordinary leaf spot of that plant. An examination of diseased material showed, however, that it was caused by an entirely different fungus (*Dendryphium comosum*).

This disease which, according to the account, is confined to cucumbers grown under glass, appears early in March and attacks the plants while quite young, destroying the tissues of the leaf, and in bad cases also infecting the growing points of the shoots. The fungus is usually recognized as a saprophyte and was probably introduced into the cucumber houses by the manure that was used. So far only the conidial phase has been discovered, but the fungus is still under observation.

The writer believes that by ventilating the houses and securing a drier atmosphere the disease can be greatly restricted, and if necessary spraying the plants with a weak solution of potassium sulphide would prove advantageous.

Cucumber leaf spot, G. Massee (*Gard. Chron., 3. ser., 34 (1903), No. 871, p. 184*).—In reply to a correspondent the author gives a description of leaf spot of cucumbers which is caused by *Cercospora melonis*. For the eradication of the disease it is recommended that the soil in the cucumber house should be disinfected by spraying with fungicides and care should be exercised to prevent too soft a growth of the foliage and the introduction of the fungus from without the greenhouse.

A mildew of rhubarb, A. Osterwalder (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 24–25, pp. 775–777, figs. 3*).—The author reports the presence of a species of Peronospora on the variety of rhubarb *Rheum undulatum*. This mildew appears upon the leaves early in the spring, producing small reddish spots, which are more or less limited by the veins. Later the spots increase in size and coalesce, destroying the leaf tissues.

The author has compared the species with *P. rumicis*, which has been previously

reported on species of Rheum, and with *P. polygoni*, and is led to believe that the fungus causing this disease is possibly identical with the latter species.

Brown rot of fruit (*Gard. Chron., 3. ser., 34 (1903), No. 864, p. 36*).—A brief account is given of the brown rot of fruit caused by attacks of *Sclerotinia fructigena* on apples, pears, plums, cherries, and peaches, as well as various wild fruits belonging to the same family of plants. The effect of the fungus on the foliage and fruit is described at considerable length.

For the prevention of the disease it is recommended that all dead twigs and shriveled fruits should be collected and burned, and the trees and ground about them thoroughly sprayed with a solution of sulphate of iron 25 lbs., sulphuric acid 1 pt., and water 50 gal. The application should be made in January or February before the leaf buds begin to swell. After the expansion of the leaves the trees should be sprayed at intervals with a weak solution of Bordeaux mixture.

Ripe rot or bitter rot of fruits, N. A. COBB (*Agr. Gaz. New South Wales, 14 (1903), No. 7, pp. 627–652, pls. 2, figs. 44*).—A report is given of the ripe rot or bitter rot of fruits, in which attention is called to a previous publication by the author stating that he was able to cause the disease in peach, plum, nectarine, pear, cherry, grape, and mango after 5 days by inoculating with the ripe rot of the apple (*Glœosporium fructigenum*).

A review is given of the work previously published by the New Jersey Stations (E. S. R., 5, p. 401) on the cross inoculation of different plants with this fungus, and a discussion is given of various inoculation experiments recently performed by the author. These inoculations included passion fruit, lemon, banana, grape, pear, date, plum, quince, apple, peach, hawthorn, guava, and tomato. Reciprocal inoculations were made between these different hosts, and the disease was produced in nearly every instance. The author is led to believe, as a result of these investigations, that there are in reality fewer forms of the fungus than have been hitherto described.

Experiments on combating downy and powdery mildew of grapes in 1902, H. KASERER (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 205–209*).—Experiments are reported on the efficiency of a number of fungicides for the prevention of the downy and powdery mildews of grapes. In one series of experiments antimony salts were tested, solutions of antimony sulphate and sodium sulphoantimoniate being employed. The solutions were rendered slightly alkaline by the addition of milk of lime and then sprayed on the grape foliage. Beginning at the same time the principal part of the vineyard was given 3 applications of Bordeaux mixture. At the end of the season no downy mildew was noticeable on the vines treated with Bordeaux mixture, while those sprayed with the antimony solutions showed evidence of Peronospora attack early in August.

A compound of copper called "resin-acid copper" in combination with sulphur was tested as a combined treatment for the downy and powdery mildew without effect. The best results were obtained from the simultaneous treatment of the 2 diseases when vines were sprayed with an alkaline Bordeaux mixture, to each kiloliter of which was added 300 gm. of sodium thiosulphate. Vines so treated did not show the slightest trace of downy mildew and powdery mildew was held in check, although especially troublesome on the adjacent unsprayed vines.

A "red scald" of grapes, H. MÜLLER-THURGAU (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 1, pp. 8–17; 2, pp. 48–61; 3, pp. 81–88; 4, pp. 113–121, pls. 5*).—A description is given of a disease of grapes in which the foliage is severely attacked. This disease has been known for a number of years, and is quite widely distributed in Switzerland, and possibly elsewhere. It is known by a number of common names, such as red scald, singe, leaf brown, sun burn, and red burn of grape leaves, the author preferring the latter designation. Both red and white grapes are subject to infection, although some variation of susceptibility of different varieties is known.

The occurrence of the disease is indicated by the appearance on the leaves of intensely red spots of varying size. These increase, destroying the chlorophyll activity of the affected portions of the leaves, and ultimately destroy the whole leaf blade. Somewhat similar appearances are said to be produced by a number of agencies, and the different causes are pointed out for each disease.

The cause of the red scald or red burn of the leaves is a fungus (*Pseudopeziza tracheiphila* n. sp.), which attacks the veins of the leaf, filling the conductive tissues with its hyphæ. The organism has been isolated and cultivated, and a diagnosis of its principal characters is given. Unfavorable soil and climatic conditions for grapes favor the rapid spread of the disease, and draining is recommended to prevent too much soil moisture. Spraying with Bordeaux mixture has given good results in the protection of plants from this disease.

Resistance to chlorosis, J. M. GUILLON and O. BRUNAUD (*Rev. Vit., 20 (1903), Nos. 513, pp. 437–441; 516, pp. 532–535, pl. 1*).—The results are given of a study of different varieties of grapes, in which the relative resistance to chlorosis was determined. The authors adopted a scale of resistance and have noted the points of resistance, from 1 to 20, for a large number of species and hybrids, particular attention being given to the hybrids of the cinerea, Arizonica, candicans, cordifolia, and æstivalis grapes.

Among the European species *Vitis vinifera* is one of the most resistant, and among the American introductions *V. berlandieri* is most resistant to this disease. The hybrids between these species are also found to be quite resistant. The rupestris and riparia hybrids are much more subject to attack than the others described.

The bacteriosis of roses, G. SCALIA (*Agr. Calabro Siculo, 1903; abs. in Bot. Centbl., 93 (1903), No. 34, p. 194*).—A preliminary note is given of a tuberculous disease of roses, which has been observed in Catania, attributed to the action of bacteria. The author has isolated a number of organisms, one of which seemed to be quite constant in its occurrence and character, and for this the provisional name *Bacillus rosarum* is given. It is proposed to study the subject further.

A bacterial disease of sugar beets, G. G. HEDGCOCK and H. METCALF (*Ztschr. Pflanzenkrank, 12 (1902), No. 6, pp. 321–324*).—In the abstract of this article (E. S. R., 14, p. 1085) the bacterium should have been described as not growing upon dextrose gelatin and only slightly, if at all, upon potato, and as producing no color or gas, in contradiction to the organism described by Kramer.

Diseases of chrysanthemums, G. E. STONE (*Amer. Florist, 21 (1903), No. 806, pp. 583, 584*).—The effect of heat, moisture, light, and the circulation of air as factors in diseases of plants grown under glass are discussed, after which special attention is given to the diseases of chrysanthemums. The powdery mildew, rust, and stem rot are described, the rust and stem rot being reported as the most troublesome. Anthracnose of chrysanthemums and 2 forms of leaf spot are briefly mentioned, and in conclusion the author states that cultural methods rather than remedial treatments should be adopted in combating plant diseases in greenhouses.

The chrysanthemum rust, E. JACKY (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 12, pp. 369–381, figs. 8*).—In the author's previous report of studies on the rust of chrysanthemums (E. S. R., 13, p. 153) the identity of the fungus *Puccinia chrysanthemi* and other forms was discussed, and this species was considered different from *P. tanaceti* in its morphological and physiological characters.

The form occurring in Japan and lately described as *P. chrysanthemi chinensis* is reported upon in the present paper. Inoculation experiments with Japanese material showed that the rust is a Hemipuccinia and is capable of invading *Chrysanthemum indicum*, as well as its usual host, *C. chinense;* and it appears to differ from the usual form of *P. chrysanthemi* mainly in the character of its teleutospores.

The author has investigated the question of varietal predisposition to rusts, and so

far as his experiments go could find no evidence of such variation, and believes the resistance of certain varieties to disease is not as common as previously claimed. Infection takes place, so far as *P. chrysanthemi* is concerned, almost entirely through the uredospores. The paper concludes with an account of the morphological and physiological characters of the different species and varieties of chrysanthemum rusts.

Remarks on the biology of chrysanthemum rusts, P. MAGNUS (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 18–19, pp. 575–577*).—Attention is called to the investigations of Jacky, in which the possible identity of species of chrysanthemum rust is suggested and the fact pointed out that the Puccinia produces teleutospores in Japan but only uredospores in Europe. Other examples are cited of somewhat similar phenomena among related fungi.

The cause and prevention of a tulip disease, J. RITZEMA BOS (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), Nos. 1, pp. 18–26; 3, pp. 84–94*).—A description is given of a disease of tulips and some other bulbous plants, which is due to attacks of *Botrytis parasitica*. This article is essentially the same as one by the author noted from another source (E. S. R., 15, p. 273).

Standard fungicides (*Gard. Chron., 3. ser., 34 (1903), No. 864, pp. 40, 41*).—A detailed note describing the use of fungicides, and giving quotations from a number of publications relative to the preparation and use of Bordeaux mixture, ammoniacal-copper carbonate, etc.

On the adherence of copper fungicides, M. FRÉMONT (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 38, pp. 351–353*).—The results of a study of a number of fungicides to test their adhesiveness are given.

The author tested 4 fungicides, each of which contained copper sulphate and carbonate of soda in about the same proportion, to which was added soap, permanganate of potash, and a commercial product known as alkaline polysulphate. These different fungicides were prepared and carefully sprayed in order to distinguish the rapidity of their drying, as well as the duration of their adhesiveness when exposed to ordinary weather conditions.

All of the fungicides adhered very well to the foliage. The mixture containing the polysulphate dried most rapidly, being thoroughly adhesive in 10 to 15 minutes. Next in adhesiveness was the mixture containing soap solution, followed by that containing the potassium permanganate. The simple solution of sulphate of copper, carbonate of soda, and water required the longest time to dry and was less adherent than the other forms.

ENTOMOLOGY.

Observations made by the entomological service of the agricultural institute in 1902, POSKIN (*Bul. Agr. [Brussels], 19 (1903), No. 2, pp. 181–199*).—*Bibio hortulanus* is reported as injurious to various garden crops. In combating this insect it is recommended that the base of the plants and the adjoining soil be sprayed with tobacco decoction. Pears are said to suffer considerable injury from the attacks of *Cecidomyia nigra*. This insect may be controlled to some extent by the collection and destruction of infested pears.

Extensive injuries are reported from the attacks of the codling moth, and a number of experiments are reported in the control of this insect. It is recommended that infested apples be destroyed and that the insects be destroyed in their hiding places by spraying with tobacco decoction, or some other contact insecticide. The larvæ may be controlled by spraying with a Paris green solution to which small quantities of lime are added. Notes are also given on the injuries caused by field mice and on inoculation and other methods for combating this pest.

The leaf hopper of the sugar cane, R. C. L. PERKINS (*Hawaii Bd. Comrs. Agr. and For., Div. Ent. Bul. 1, pp. 38*).—A leaf hopper injurious to sugar cane is described

as new under the name *Perkinsiella saccharicida*. This insect was first observed in 1900 and has since become much more numerous and injurious. The species is native to Hawaii and differs from related species in Australia and other tropical countries. Detailed notes are given on the appearance, habits, and life history of this insect. When the leaf hopper was present in large numbers the midrib and sheath of the leaf became red in spots or almost uniformly, and since the insect secretes honeydew this substance becomes covered with a fungus which gives a peculiar appearance to the affected canes. Certain varieties of cane appear to be more resistant than others.

A large number of natural enemies of this pest are noted, including parasitic and predaceous insects, spiders, and fungi. The author believes that the repression of this pest must be brought about by encouraging its natural enemies and introducing other beneficial species from foreign countries. The successful use of artificial insecticides is believed to be impracticable. Experiments were made by C. F. Eckart, during which the effect of corrosive sublimate, hydrocyanic-acid gas, and carbolic acid upon the cane-leaf hopper were tested. The immersion of infested sections of sugar cane in solutions of corrosive sublimate and carbolic acid, varying from 1 to 2 per cent, and for periods ranging from 3 to 6 hours, showed that the solutions of carbolic acid were ineffective in destroying the eggs of the insect, while corrosive sublimate solutions exhibited considerable effectiveness.

Fumigation with hydrocyanic-acid gas was sufficient to destroy the eggs when infested cane sections were treated for a period of 6 hours or more. The treatment with this gas had a marked effect on the vitality of the cane, while corrosive sublimate apparently had no injurious influence except when used in strong solutions.

The Mexican cotton-boll weevil, L. O. HOWARD (*Science, n. ser., 18 (1903), No. 465, p. 693*).—Notes are given on the investigation of this insect which was begun by the Division of Entomology in 1894, and which has led to the discovery of a method by which a fair crop of cotton can be raised under conditions of infestation by this insect.

Cutworms, J. R. ANDERSON (*Dept. Agr. British Columbia, Bul. 9, pp. 8*).—Descriptive, economic, and biological notes on *Peridroma saucia*. In combating this insect the use of poisoned bait is recommended. The cutworms may be prevented from climbing into fruit trees by the use of mechanical obstructions.

The codling moth regulations, G. QUINN (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 2, pp. 89–92*).—Circulars of information relating to the best methods of controlling and eradicating codling moth have been distributed to various apple growers throughout South Australia and requests were made for information concerning the results obtained by the application of these methods. A large percentage of apple growers were found to be opposed to compulsory spraying, in favor of banding, and opposed to unrestricted sale of infested fruit.

The moth book, W. J. HOLLAND (*New York: Doubleday, Page & Co., 1903, pp. XXIV+479, pls. 48, figs. 263*).—This volume is a companion to the author's butterfly book and is intended to cover the subject of moths in the same manner. No attempt is made to list all of the species of moths occurring in North America, but the common representatives of the more important genera are briefly described and notes are given on their habits and life history. The identification of the species mentioned in the volume is facilitated by the numerous illustrations. Special chapters are presented on the life history and anatomy of moths; capture, preparation, and preservation of specimens; classification of moths; and books relating to moths of North America.

Aquatic insects in New York, J. G. NEEDHAM ET AL. (*New York State Mus. Bul. 68, pp. 197–517, pls. 52, figs. 26*).—This bulletin constitutes a compendium of the general study of aquatic insects in New York, conducted under the direction of E. P. Felt. The subjects discussed in the bulletin include an account of the station

work for the summer of 1901 (pp. 200–204), the food of the brook trout (pp. 204–217), life histories of dragon flies (pp. 218–279), and life histories of Diptera (pp. 279–287); these 4 articles being prepared by J. G. Needham.

The bulletin also contains a discussion of aquatic Chrysomelidæ, by A. D. MacGillivray (pp. 288–327); aquatic nematocerous Diptera, by O. A. Johannsen (pp. 328–441); and the Sialididæ of North and South America, by K. C. Davis (pp. 442–486). It is well illustrated, and is intended as a basis for the study of the economic relations of aquatic insects and food fishes, and for the stimulation of similar lines of investigation by students in entomology and economic zoology.

Remedies for insects, C. W. Woodworth (*California Sta. Circ. 7, pp. 19*).—This is a second revision of Bulletin 115 of the same station (E. S. R., 9, pp. 157, 158).

Fumigation, W. J. Allen (*Agr. Gaz. New South Wales, 14 (1903), No. 7, pp. 597–606, pl. 1, figs. 3*).—The chief causes of failure in fumigation are believed by the author to be carelessness in estimating the size of the tree, fumigating at the wrong time, and carelessness in weighing cyanid. Attention is called to the necessity of exercising care in estimating the volume of the tent, in keeping all holes in the tent closed, and in weighing the cyanid and sulphuric acid. The best time for fumigating in New South Wales is believed to be in June and February, and it is recommended that the work be done at night. Extensive tables are presented showing the amount of chemicals to be used for trees of various sizes.

Sarcopsylla gallinacea in Europe, C. Tiraboschi (*Arch. Parasit., 7 (1903), No. 1, pp. 124–132*).—Notes are given on the habits and life history of the hen flea as observed in various parts of Europe. This insect is also reported as occurring quite commonly on various species of rats, and these animals may therefore be held responsible to some extent for distributing the fleas.

Observations on the Culicidæ, L. Dyé (*Arch. Parasit., 6 (1903), No. 3, pp. 359–376, figs. 5*).—Descriptive notes are given on *Myzorhynchus coustani* and *Stegomyia fasciata*. The habits and life history of these species are mentioned in detail with special reference to the agency of *S. fasciata* in transmitting yellow fever. The literature of the subject is reviewed in connection with a brief bibliography.

Studies on Culex and Anopheles, B. Galli-Valerio and Jeanne Rochaz-De Jongh (*Atti. Soc. Studi Malaria, 4 (1903), pp. 3–48, fig. 1*).—The authors studied the conditions under which mosquitoes might successfully breed and made a number of experiments in testing the effect of various impurities in water in which were found the eggs and larvæ of mosquitoes. During these experiments a test was made of the effect of elevation of temperature of the water upon the eggs of the mosquitoes, and also of the effect of desiccation and various insecticides upon the eggs and larvæ. It was found that a temperature of 40° C. is required for destroying all the larvæ in water. Attention is called to the great importance of draining small pools or ponds or treating them with kerosene oil in order to prevent the undue multiplication of mosquitoes.

The habits of the larvæ of Anopheles in relation to hydraulic engineering, E. Perrone (*Atti. Soc. Studi Malaria, 4 (1903), pp. 49–58*).—The author calls attention to the great multiplication of mosquitoes which may take place in pools of water in excavations for building sites or for other purposes of construction.

Forty years among the bees, C. C. Miller (*Chicago: George W. York & Co., 1903, pp. 327, pp. 111*).—A popular account of the general subject of rearing and managing bees, with notes on the recent methods of feeding and wintering bees, swarming, and care and manipulation of bee products.

The combination of swarms of bees, A. Delépine (*Jour. Agr. Prat., n. ser., 6 (1903), No. 42, p. 510*).—The author describes briefly 2 methods of bringing about the combination of 2 swarms of bees, viz, that in which the 2 hives are placed side by side, and the method of superposition.

Experimental researches on heredity in silkworms, G. Coutagne (*Bul. Sci. France et Belg., 37 (1903), pp. 1–194, pls. 9, figs. 7*).—An extended study was made of the influence of various conditions upon the various races of silkworms with special reference to the transmission of these characters in hybrids or pure-bred descendants of the individual silkworms upon which experiments were made. These experiments were undertaken chiefly from a biological standpoint, and thus far have not led to definite results which can be utilized in practical sericulture.

It was found that the quality and quantity of the silk could be considerably influenced by temperature, moisture, and other conditions under which the silkworms were maintained. In a certain percentage of cases success was had in securing the transmission of especially desirable characters from parents to offspring. It was found that the probability of the transmission of acquired characters to offspring could be stated with some degree of accuracy according to mathematical formulas.

FOODS—NUTRITION.

Roasting of beef, Isabel Bevier and Elizabeth C. Sprague (*Illinois Sta. Circ. 71, pp. 30*).—The influence of different shapes and sizes of pans, time of cooking, heat of the oven, and other factors upon the character of roasted meat (beef) was studied with the special purpose of securing data on the effects of cooking.

In a comparison of an oval concave pan with open and closed rectangular pans with flat bottoms, it was found that so far as total losses in weight were concerned, the shape and size of the pan did not seem to be of great importance. So far as color and consequently the flavor of the drippings were concerned, the area of the pan and its shape were important, the pan with the smaller area giving the lighter colored drippings in the experiments reported.

"If the whole amount of drippings was used for gravy, the darkening if not excessive might not be undesirable, but because of the number of uses for the excessive fat in drippings, it is desirable to avoid the darkening of them. Moreover, authority can be found for the idea that this darkening means that the fat was heated to such a temperature as to render it less digestible."

The results obtained with different sized pans were not definite as regards the losses in weight in cooking. In comparing open and closed pans it was found that the total losses in weight in roasting were greater in the open pan. However, when cooked in a closed pan the meat was inferior in flavor, and was not as attractive in appearance, since it did not brown well, nor was the color satisfactory if browned outside the pan and subsequently cooked. The meat cooked to a greater degree in the closed pan in 15 minutes than in the open pan. When cooked in a closed pan a larger percentage of the material lost was recovered in the drippings, owing to the fact that in the open pan the drippings are almost water free, while in the closed pan considerable water is retained.

As regards the effect of temperature, in the 14 experiments in which this factor was considered the heat of the oven ranged from 83 to 260° C., and the total loss in weight from 5.9 per cent to 20.6 per cent, which was less than one-sixteenth of the total weight of the beef roast used. In general, the higher the temperature the greater the loss in roasting. A temperature of not less than 249° C. was required for the development of the so-called osmazome and the flavors in the meat. When meat is baked for a short time at a very high temperature, 260° C., the outside layer is apt to be overdone and the center too rare for use. When baked very slowly in a special oven at a comparatively low temperature it was very evenly cooked throughout and the juices were well retained, but the savoriness and flavor produced by higher temperatures were lacking. Even if the meat was seared before cooking in this oven it did not retain this appearance, but came from the oven gray and unattractive. "If

browned at the end of the process the outside became tough and seemed to have the characteristics of over-cooked albumen emphasized."

The effect of basting was studied, and in the opinion of the authors the only definite conclusion which can be drawn regarding the differences between the basted and the unbasted meat was that when cooked under otherwise identical conditions the former was always the rarer. Evidently the temperature of the roast was lowered by basting it.

Summarizing the results of 21 tests, the total meat before roasting weighed 62 lbs. and after cooking 52.25 lbs., the loss being about one-sixth of the original weight. The average cost of the cooked meat was 19.2 cts. per pound, "an increase of 4 cts. a pound over the original cost." The possibility of using drippings, the loss of weight in boning, and some other problems were also considered.

Relative merit of butter or oil in cookery (*Dietet. and Hyg. Gaz., 19 (1903), No. 5, p. 303*).—A brief note quoting experiments with animals by P. Carnot and Miss Deflandre, in which the digestibility of fat is shown by the action of osmic acid on sections of liver substance. The quantity of fat thus obtained was greater after the ingestion of butter than after cod-liver oil or neat's-foot oil. Vegetable oils, such as olive oil, were not found to be as well assimilated by the liver as animal oils. On the basis of these experiments the superiority of animal to vegetable oils for culinary purposes is pointed out.

Further investigations among fruitarians at the California Agricultural Experiment Station, 1901-1902, M. E. JAFFA (*U. S. Dept. Agr., Office of Experiment Stations Bul. 132, pp. 81*).—Continuing earlier work (E. S. R., 13, p. 974), 9 dietary studies and 31 digestion experiments with subjects on a more or less strictly fruitarian diet were carried on at the University of California. Some of the subjects had for years confined their diet to vegetables and fruits; others were used to the ordinary fare.

While part of the dietaries make it plain that it is possible to obtain the requisite amount of protein and energy from a fruitarian diet, the majority of those studied fell below the tentative dietary standards, but, as the author notes, it is not just to ascribe this to the form of diet, since the same people might have consumed no larger quantities of nutrients on a mixed diet. In several cases small quantities of cereals and other common foods were eaten to render the rather unusual food combinations more palatable. The dietaries which contained cereals furnished more protein and energy in most cases than those which were limited strictly to fruits and nuts. The cost of the food per person per day ranged from 18 to 46 cts.

Considering the digestion experiments as a whole, the fruit and nut diets had the following coefficients of digestibility: Total organic matter 90.26 per cent, protein 75.30 per cent, fat 86.43 per cent, nitrogen-free extract 95.10 per cent, crude fiber 78.54 per cent, and ash 54.76 per cent, the available energy being 86.13 per cent.

"As shown by their composition and digestibility, both fruit and nuts can be favorably compared with other and more common foods. As sources of carbohydrates, fruits at ordinary prices are not expensive, and as sources of protein and fat, nuts at usual prices are reasonable.

"In the present investigations the question of the wholesomeness of a long-continued diet of fruit and nuts is not taken up. The agreement of one food or another with any person is frequently more or less a matter of personal idiosyncrasy, but it seems fair to say that those with whom nuts and fruits agree can, if they desire, readily secure a considerable part of their nutritive material from such sources."

Concerning the diet in public institutions, E. O. HULTGREN (*Versamml. Nord. Naturf. u. Aerzt., Verhandl. Sek. Anat., Physiol. u. Med. Chem., 1902, pp. 77-85*).—Studies of the diet in a number of hospitals in Stockholm are briefly reported.

Notes on the feeding of troops, VARGES (*Deut. Mil. Aerztl. Ztschr., [illegible], No. 5, p. 251; abs. in Hyg. Rundschau, 13 (1903), No. 15, pp. 785, 786*).—A tablet composed

of skim milk and egg yolk is described, which is proposed as a substitute for the canned meat in the ration of troops on the march. Skim-milk tablets containing sugar, cacao, and citric acid are also spoken of.

Cost of living (*U. S. Dept. Com. and Labor, Bureau of Labor Bul. 49, pp. 1137–1141*).—Data are given regarding the income and expenditures of 2,567 families in 33 States for the year 1901, the basis of selection being "that the head of the family must be a wage worker or a salaried man earning not over $1,200 during the year, and must be able to give information in regard to his expenditures in detail."

It appeared that the expenditure for food represented 42.54 per cent of the total family expenditure. This was an increase of 16.1 per cent over the corresponding expenditure for 1896, the year of lowest prices in the period covered by the data recorded by the Bureau, and an increase of 10.9 per cent as compared with the average of the period extending from 1890 to 1899. The article also includes data regarding the retail prices of food in the regions represented by the families studied.

Feeding adults with cows' milk and human milk, A. Schlossmann and E. Moro (*Ztschr. Biol., 45 (1903), No. 3, pp. 261–291*).—A comparative study of the nutritive value of cows' milk and human milk, one of the authors being the subject.

On the influence of diet, muscular exertion, and loss of sleep upon the formation of uric acid in man, H. C. Sherman (*Jour. Amer. Chem. Soc., 25 (1903), No. 11, pp. 1159–1166*).—The formation of uric acid was studied in connection with experiments with professional athletes of the effect of severe and prolonged muscular work on food consumption, digestion, and metabolism previously reported (E. S. R., 13, p. 575), and similar studies with a professional man on the effect of loss of sleep (E. S. R., 14, p. 788).

According to the author's summary "both with professional athletes and with the subject of sedentary habits, the elimination of uric acid was primarily dependent upon the food consumed.

"While very small changes, apparently, resulted from large variations in the amount of a bread-and-milk diet, the elimination of uric acid was mainly determined by the quantities of meat products consumed.

"In the case of well-trained professional athletes very severe and prolonged muscular exertion had little influence upon the formation and elimination of uric acid, except indirectly, by inducing an appetite for stimulating foods such as meat extracts.

"Marked loss of sleep had no apparent influence upon the amount of uric acid eliminated."

The effect of different foods on the water content of organs and the hemoglobin content of blood, J. Tsuboi (*Ztschr. Biol., 44 (1903), No. 3, pp. 376–406*).—Experiments with animals led to the conclusion that the hemoglobin content of the blood can be influenced by the food, being diminished in the experiments reported. When on an insufficient diet of bread and potatoes the carbohydrates were very abundant in comparison with protein. At the same time the insufficient food causes an increase in the water content of the blood and of the whole body.

The hemoglobin content of muscles, K. B. Lehmann et al. (*Ztschr. Biol., 45 (1903), No. 3, pp. 324–345*).—The author summarizes the results obtained by 5 of his students on the occurrence of hemoglobin in different sorts of muscular tissue. Some of the principal conclusions follow:

The muscles of young animals in general contain less hemoglobin than those of adults, apparently owing to the fact that they are less used. In young animals of the same kind marked differences were observed in the blood content of corresponding muscles, which could not be explained by a difference in age, but seemed to be due to heredity or other special cause. With adult animals the differences were often greater and were more difficult of explanation.

The effect of exercise on the color of the muscular tissue is spoken of in connection with the flesh of game, attention being directed to the high blood content of

venison and the dark-red color of squirrel flesh. In birds, the groups of muscles which are most used contain about 3.7 per cent blood and those least used 1 to 1.6 per cent. The flesh of chicken is characterized by a very low hemoglobin content.

The general conclusion is drawn that the blood content of striated muscle of warm-blooded animals often depends on the frequency and intensity of exercise. The hemoglobin content of the flesh of cold-blooded animals is discussed and other related topics, including the connection between hemoglobin content and the flavor of flesh foods. The author states that in general, though not always, other soluble bodies are present in abundance when the hemoglobin content is high. In other words, the red muscular tissues, generally speaking, have the most pronounced flavor.

On the time relations of proteid metabolism, P. B. HAWK (*Amer. Jour. Physiol., 10 (1903), No. 3, pp. 115–145, figs. 4*).—In experiments with 2 men the time relations of proteid metabolism were studied. After the ingestion of an extra quantity of proteid it was found that the nitrogen excretion began to rise rapidly, the point in maximum excretion being reached in 6 to 9 hours with one subject and in 9 to 12 hours with the other, this point of maximum excretion being followed at once by a very rapid fall which after a few hours gradually returned to the normal rate. The minimum rate of nitrogen excretion for each subject was observed during the night period.

In general, the excretion of sulphur was parallel to that of nitrogen, the maximum excretion occurring with each subject 6 to 9 hours after the ingestion of the proteid, and the normal rate being regained in 24 hours. In the case of one subject a tendency to 2 maxima daily was noted in the excretion of phosphorus. With the other subject a single maximum was generally observed, the normal level being regained with each subject in the first period of the day following the experimental day in which the extra proteid was taken at breakfast.

The ratio of the nitrogen content of the urine to the heat of combustion of its unoxidized material was somewhat lower on the day of extra proteid ingestion than on normal days.

Influence of rennin upon the digestion of the proteid constituents of milk, P. B. HAWK (*Amer. Jour. Physiol., 10 (1903), No. 1, pp. 37–46*).—Artificial digestion experiments led the author to conclude that rennin inhibits the digestion of milk proteids and that rennin ash does not possess this property. The inhibitory action of rennin upon the digestion of milk proteids was not modified by preliminary contact with pepsin solution at 40° C. for 30 minutes. Paracasein was found to be somewhat more difficult of digestion than casein. Rennin retarded the pancreatic digestion of milk proteids in alkaline or neutral solution, but had no inhibitory action upon the gastric digestion of fluid egg albumen.

Results of tests with man and animals of 50 coal-tar colors, G. W. CHLOPIN (*Hyg. Rundschau, 13 (1903), No. 15, pp. 753–756*).—The author summarizes briefly the results of an extended investigation of coal-tar colors from a hygienic standpoint, the results of which have not yet been published in detail. Experiments of 8 to 14 days' duration were made with dogs, in which 1 to 3 gm. of the different colors studied were introduced into the stomach daily.

The effect of the colors on human skin was also studied, subjects wearing on the hands or feet for 10 or 14 days woolen or cotton bandages colored with the dyes studied. Fifteen colors, or 30 per cent of the dyes studied, are regarded as poisonous, since they caused the death of the dogs or marked symptoms of poisoning. Seven of these 15 colors belong to a group whose constitution is not known, namely, the so-called Widal colors containing sulphur. Forty per cent of the dyes were regarded as harmful since they caused serious functional disturbances, as vomiting, diarrhea, or the excretion of albumin in the urine.

In the test of the effect of the colors upon the skin only 2 were found to be poisonous, namely, Ursol *d* and Auramin *o*, the effect of the former being much the more pronounced. In the author's opinion, with the data at present available no relation can be traced between the chemical classification of the coal-tar dyes and their physiological and toxicological properties. It should be noted, however, that he, as well as other investigators, did not find that any of the red dyes were poisonous.

Composition of East Indian foods according to analyses made in the laboratory of the Colonial Museum at Haarlem, M. Greshoff and J. Sack (*Bul. Koloniaal Mus. Haarlem, 1903, No. 28, Sup.*).—In continuation of earlier work [a] by the authors and J. J. van Eck, analyses of 100 samples of East Indian food materials are reported in tabular form, together with brief descriptions of the samples.

The composition of Indian food materials, M. Greshoff (*Chem. Ztg., 27 (1903), No. 42, pp. 499–501*).—Analyses are reported of 200 food materials from the Dutch East Indies, including cereals, legumes, flours, starches, bread, pastry, seeds and fruits, edible fungi, preserves and pickles; fresh, dried, and preserved fish and meat; oysters and other sea food; eggs of different sorts, edible birds' nests, and miscellaneous food products.

Some of the fruits, fresh and preserved, which were analyzed follow: Bananas, dates, box myrtle (*Myrica sapida*), durian (*Durio zibethinus*), Indian mulberry (*Morinda citrifolia*), *Gnetum gnemon, Averrhoa carambola, Bouea macrophylla,* and *Zalacca edulis.* These analyses were made under the author's direction by J. Sack and J. J. van Eck, and the present account, which includes only analytical data, is a summary of material which has been reported in publications of the Haarlem Koloniaal Museum (see above), later figures being given in a few instances.

Concerning plum jam, R. Woy (*Ztschr. Oeffentl. Chem., 8 (1902), pp. 270, 271; abs. in Hyg. Rundschau, 13 (1903), No. 15, p. 793*).—Three analyses of plum jam are reported.

Nut menu, A. S. Flowers (*Mount Joy, Pa.: Author, 1903, pp. 42, pls. 7*).—A large number of recipes are given for the preparation of various dishes from chestnuts and other nuts. The value of nuts as food is also briefly discussed.

Cocoa and chocolate, C. B. Cochran (*Pennsylvania State Dept. Agr. Rpt. 1902, pt. 1, pp. 662–679, pls. 4*).—Cacao beans, chocolate, and other cacao products are described, as well as their principal chemical constituents, the object being to present data useful for the detection of adulterants. The author also gives information concerning several adulterants of cocoa butter, "chocolate glazing," and the starches used as adulterants of chocolate.

Analyses of salt (*Connecticut State Sta. Rpt. 1902, pt. 4, p. 424*).—Analyses of 4 brands of salt are reported.

Some food products and food adulteration, E. F. Ladd (*North Dakota Sta. Bul. 57, pp. 249–315*).—In compliance with the State Pure Food Law, analyses were made of a number of samples of canned fruits and vegetables, vinegars, and flavoring extracts. The detection of sulphites and formic acid in canned goods when the manufacturers state positively that such materials had not been added leads the author to suggest that possibly these materials are added to fresh berries by producers and shippers. "Future investigations must determine whether this supposition is correct." The use of saccharin is briefly discussed.

Seventeenth annual report of the Ohio Dairy and Food Commissioner, J. E. Blackburn (*Ohio Dairy and Food Com. Rpt. 1902, pp. 100*).—In addition to the financial report of the State dairy and food commissioner, statistics are given of the number of foods and condiments examined, and the results of the examination.

German meat regulations (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 50,*

[a] Bul. Koloniaal Mus. Haarlem, 1900, Nos. 22, Sup.; 23, Sup.; 1901, No. 25, Sup.

pp. 51).—For the information of American packers and exporters, a translation of the German official regulations and proclamations which have a direct bearing upon the meat-inspection law have been published. The translation is accompanied by the original German text.

Encyclopedia of household enconomy, EMILY HOLT (*New York: McClure, Phillips & Co., 1903, pp. 381, pls. 11*).—This volume includes useful information on cooking, preservation of fruits, vegetables, etc., sanitation, water supply, and other topics connected with the household.

ANIMAL PRODUCTION.

The status of phosphorus in certain food materials and animal by-products, with special reference to the presence of inorganic forms, E. B. HART and W. H. ANDREWS (*New York State Sta. Bul. 238, pp. 181–196*).—It is apparently quite generally believed that phosphorus exists in vegetable products partly in organic compounds and partly as inorganic salts. With a view to determining the correctness of this belief the authors studied the character of the phosphorus bodies in a number of animal and vegetable products.

Different methods of separating and estimating organic and inorganic phosphorus were tested and compared, that finally adopted depending upon the solubility of phosphorus compounds in hydrochloric acid. Samples of suitable size are treated with this reagent, and the inorganic phosphorus and the total phosphorus removed by it are determined in aliquot portions of the extract, the total soluble phosphorus by the Neumann method, and the inorganic phosphorus as magnesium pyrophosphate, minimum amounts of nitric acid being added to insure quantitative separation of ammonium phospho-molybdate and to prevent the cleavage of the organic phosphorus compounds into organic and inorganic radicals. Any phosphorus in the original substance undissolved by the reagent used is assumed to exist in organic compounds as nucleo-proteids, nucleins, and lecithins, and its amount is directly determined, as is also the total phosphorus in the materials studied.

The following table shows the amounts of different kinds of phosphorus compounds in a number of materials as determined by the method outlined, and for comparison the results obtained by similar methods, water and dilute acetic acid being used as solvents:

Forms of phosphorus in a number of feeding stuffs and in feces.

Substance.	Total phosphorus.	In aqueous extract.		In acetic-acid extract.		In hydrochloric-acid extract.	
		Total soluble phosphorus.	Inorganic phosphorus.	Total soluble phosphorus.	Inorganic phosphorus.	Total soluble phosphorus.	Inorganic phosphorus.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oats	0.355	0.180	....	0.114	....	0.096	....
Bran (wheat)	1.548	.356	0.143	1.100	0.055	.951	0.036
Malt sprouts	.677	.548	.391	.489	.279	.477	.017
Brewers' grains	.421	.142	.007	.039	.007	.040	.009
Distillers' grains	.307	.079	.012	.104	.005	.069	.007
Corn	.313	.276	.014	.203	....	.177	....
Alfalfa	.266	.196	.064	.182	.079	.180	.079
Linseed meal	.789	....	....	.327	.085	.195	.088
Oat straw	.135	....	....	.095	.028	.086	.009
Wheat	.390	.125	.028	.174	.040	.172	.008
Blood	.123	.029	.005	.028	.010	.054	....
Meat meal	4.073	....	....	....	....	1.387	.098
Liver-meat meal	1.034	....	....	....	....	.486	.005
Cow feces	.344	....	....	....	....	.148	.004

The experiments led to the conclusion that commercial feeding stuffs of vegetable origin do not contain appreciable quantities of phosphorus in inorganic compounds, and that feeding stuffs of animal origin, such as liver meal and dried blood, are also approximately free from such phosphorus compounds. Commercial meat meal, which contains varying quantities of bone, contains inorganic phosphorus due to the presence of more or less bone. The cow manure was also found to be free from inorganic phosphorus. It was evident that it was possible by different methods of manipulation to increase the amount of inorganic phosphorus found in different materials, owing to the cleavage of inorganic phosphorus compounds from bodies rich in phosphorus, such as nucleic acid.

The amount of different sorts of phosphorus compounds in germinated and ungerminated seeds was also studied, the period of germination extending over 2 weeks. "Our results bring us to the conclusion that during germination there is a proteolysis of nucleo-proteids with formation of more soluble mobile nucleins and nucleic acids, but not a transformation of the organic phosphorus into the inorganic."

In the comments by W. H. Jordan, which are appended to the report, the importance of the study of different phosphorus compounds from the standpoint of nutrition is discussed.

Commercial feeding stuffs, E. H. Jenkins et al. (*Connecticut State Sta. Rpt. 1902, pt. 4, pp. 359–423*).—Three hundred samples of commercial feeding stuffs were analyzed under the State law, including cotton-seed meal, old and new process linseed meal, wheat brans and middlings, mixed wheat feeds, gluten meal, gluten feed, corn meal, hominy feed, rye bran, rye feed, malt sprouts, brewers' grains, ground oats, oat feed, buckwheat middlings and hulls, peanut bran, broken peanuts, distillers' grains, white meal, proprietary feed, and cereal breakfast food by-products, and calf meal.

"The composition of most of the feeds which have guaranties is in substantial agreement with these guaranties. The only evidence of deliberate fraud in the feed market which is shown by the analyses is the mixing of finely-ground corncob or corn bran with mixed wheat feed, and selling this mixture in packages which do not bear the name of the manufacturers nor any statement giving the composition of the mixture. . . . The prices charged at present for commercial feeding stuffs often bear no relation to their chemical composition or feeding value. It therefore requires special care and intelligence to select feeds which shall be economical for the dairyman or feeder of other stock. The standard feeds sold by reputable dealers are, as a rule, much 'cheaper' and more satisfactory than the low-priced factory wastes."

Inspection of feeding stuffs, W. H. Jordan and F. D. Fuller (*New York State Sta. Bul. 240, pp. 213–250*).—From October, 1902, to February, 1903, 518 samples were analyzed under the State feeding-stuffs law, including cotton-seed meal, distillers' grains, brewers' grains, ground linseed cake, linseed-oil meal, gluten meal, gluten feed, hominy feed, malt sprouts, germ-oil meal, ground oats, corn meal, bran and corn meal, mixed feeds (bran and middlings), wheat offals (bran and middlings, unmixed), proprietary and mixed feeds (mostly corn and oat products), chicken feed, pigeon feed, duck feed, animal meals and similar products, rye flour, rye feed, buckwheat feed, and barley skimmings.

"No adulteration was observed among the cotton-seed and linseed meals, gluten products, and brewery and distillery residues, as shown by the official samples. Corncobs were shown to be present in 3 brands of licensed feeds, in 2 samples of unlicensed bran, and in 1 sample sold as pure corn meal. Several proprietary feeds were found, as usual, to be made up in part of oat hulls. Many samples of wheat offals, bran, middlings, and the same mixed, were found to be unadulterated and of good quality. The same can be said of numerous samples of corn and oats ground together.

"The markets are offering many inferior feeding stuffs. At the same time, the great bulk of commercial cattle foods available to buyers are unadulterated and of good quality."

Licensed concentrated feeding stuffs, F. W. WOLL and G. A. OLSEN (*Wisconsin Sta. Bul. 100, pp. 13–17, 20–22*).—This contains a list of 49 brands of commercial feeding stuffs licensed for sale in the State during 1903, suggestions as to the purchase of concentrated feeding stuffs, and the text of the Wisconsin feeding-stuff law.

Farm products and foods, F. T. SHUTT (*Ottawa: House of Commons, 1903, pp. 22*).—The comparative value of different cattle feeds, the feeding and management of chickens, and other topics are included, the matter being summarized from publications of the Canada experimental farms.

Concerning an animal meal, GLAGE (*Monatsh. Prakt. Thierh., 13 (1902), p. 550; abs. in Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 11, p. 353*).—The possible value of sterilized animal meal made from the bodies of animals which have been destroyed is discussed.

Intensive feeding of animals with fenugreek, SCHLAGDENHAUFFEN and REEB (*Rec. Méd. Vét., 8. ser., 9 (1902), No. 5, pp. 161–165; abs. in Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 5, p. 146*).—Noted from another publication (E. S. R., 14, p. 381).

Different applications of the results of recent investigations in animal production, M. FISCHER and O. KELLNER (*Fühling's Landw. Ztg., 52 (1903), Nos. 9, pp. 305–310; 10, pp. 346–351; 11, pp. 396–402; 13, pp. 475–482*).—A controversy between the authors regarding this point.

Sheep ranching in the Western States, E. V. WILCOX (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 79–98, pls. 12*).—The management and care of sheep on ranges is discussed on the basis of data gathered by the author on the sheep ranges of the western United States. It is pointed out that the natural conditions have necessarily resulted in the evolution of a different system of management from that followed in other regions, the system followed being tolerably uniform throughout the range States from Mexico to Canada.

As a general rule the sheep ranches are so located that they may be readily divided into summer and winter ranges, the summer range being located in the higher altitudes or in localities where a comparatively large amount of rainfall occurs, insuring an abundant growth of grasses and other forage crops. In some of the mountain ranges buffalo grass prevails, and in others bunch grass and various species of blue joint. Though some sheep seem to prefer grasses, there are hardly any other native plants which are not eaten to some extent, all such being classified under the local term "weeds." Some of the plants are poisonous, and as it has been found that the danger from poisoning is greatest in the early part of the season, it is a common custom to delay entering the mountain pastures until the time of greatest danger is past.

The importance of water in summer is pointed out. In winter it is less necessary, as snow takes its place. If the winter feeding ground is favorably situated, little feed is needed in addition to the self-cured grasses. With the increasing scarcity of suitable land for winter ranges the custom of supplementing the natural feed has increased, alfalfa being most commonly raised for this purpose. The number of sheep which can be maintained on an acre naturally depends upon the region. Under favorable conditions an acre will maintain 2 sheep during a whole season, while under others 2 or 3 acres will be required for a single sheep.

The cost of sheep raising naturally varies, 25 cts. per head per year being regarded as a fair estimate where the sheep raiser simply makes use of public lands, and if he be fortunate enough to find suitable grazing in localities where winter feeding is not necessary. On the other hand, sheep raisers who maintain extensive plants, feed their flocks in winter, and rent or own a considerable tract of land for grazing estimate the cost at from 75 cts. to $1.25 per head per year.

The author also discusses breeds, lambing, shearing, buildings, and other topics of importance in this connection.

Welsh mountain sheep, G. F. Thompson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 99–102, pls. 2*).—A descriptive article.

The food requirements of pigs from birth to maturity, W. L. Carlyle (*Wisconsin Sta. Bul. 104, pp. 51, figs. 13*).—The object of this investigation was to determine the food consumed and the gains made by pigs of different breeds and types from birth until they were slaughtered, and also to secure data regarding the amount and composition of sow's milk.

The animals studied included 12 sows (Berkshires, Poland Chinas, Razorbacks and crosses) and their litters. The sows ranged in age from 1 to 5 years, and in weight from 206 lbs. in the case of the yearling Razorback to 532 lbs. in the case of a 4-year-old Berkshire, the average weight being 343 lbs. The average number of pigs in a litter ranged from 5.5 pigs with the small sized sows to 9.2 pigs with the large ones, the average weight of the litters ranging in the 2 cases from 14 to 27 lbs. The age of the sows also apparently influenced the number of pigs and the weight of the litters, fewer and lighter pigs being farrowed by the younger animals.

According to the author the older and larger sows are much better mothers than the younger and smaller ones, and he believes that the common practice of many farmers in disposing of their old brood sows each year and reserving young and immature animals for breeding purposes is not to be commended.

The pigs were separated from the sows and were allowed to suckle every 2 hours during the day and every 4 hours at night. On 2 days during the fourth and eighth week each litter was carefully weighed immediately before and after nursing, the difference in weight being assumed to represent the milk yield. "The time actually spent by the pigs in nursing varied from 1 to 2 minutes, with fully one-half of this time taken in getting the milk started."

On the basis of the recorded data, the average estimated daily milk yield for 12 weeks for Berkshire sows was 6.31 lbs. per head per day, for the Poland China sows 4.86 lbs., and for the Razorback sows 5.17 lbs., the average for all being 5.44 lbs. It was observed that "some sows yield almost double the quantity of milk given by others, hence it seems evident that there is as much variation in the amount of milk given by different sows as there is among dairy cows. A marked falling off is also apparent in the quantity of milk given by all the sows from the fourth to the eighth week. . . .

"A sow is very slow in giving down her milk under normal conditions, and although not generally known it is impossible to get any milk from the udder except while some of the pigs are nursing. . . . We also learned that the forward teats on the breast of the sow gave a larger quantity of milk and gave it more freely than the teats farther back, the hindermost teats apparently yielding least of all. . . . Each pig has its particular teat at every nursing period. After the milk had been started by the rooting and kneading process of the pigs with their noses on the udder of the sow, the herdsman and his assistant quickly drew into flasks what milk they could from the vacant teats." In nearly every case at least 2 oz. was thus obtained, samples of which were analyzed.

On an average the sow's milk had a specific gravity of 1.0412, and the following percentage composition: Total solids 19.49, casein and albumen, 6.06, fat 6.89, milk sugar, 5.64, and ash 0.98 per cent.

For the first few days after farrowing the sows were fed very sparingly of shorts, oil meal, and skim milk. Later corn meal was added to their ration, the feeds being supplied ad libitum until the pigs were weaned, which was done when they were 12 weeks old. After weaning the ration was continued for 8 weeks, but the quantity was limited to an amount calculated to be just sufficient for maintenance. The data recorded show that after weaning the litters the sows required for maintenance on an

average 1.19 lbs. of grain and 2.4 lbs. of skim milk per head daily, the cost of the ration being 0.013 ct. "The Razorback sows ate less feed on the average than any of the other breeds, while they ate much more in proportion to their live weight, though they made a slight gain in weight, while the sows of the other breeds lost slightly."

As regards the gains, each pig in the litters averaging 23.5 lbs. at birth made an average gain of 4 lbs. per week for the 12 weeks before weaning, those averaging 16 lbs. an average gain of 3.6 lbs. per pig per week, and those averaging less than 15 lbs. an average gain of 2.9 lbs. per pig per week. "Many prominent breeders seem positive that a small or medium-sized litter will make better gains in the aggregate than a large one, and it not unfrequently occurs that where a large litter is farrowed they kill some of the pigs at birth. From the data presented it would seem that owing to the vitality transmitted to the pigs from their prolific dam or from some other physiological cause, the pigs in large litters are more thrifty and better feeders than those in a small litter."

From the time they were 4 weeks old until weaned the pigs were given some grain. After weaning the feeding test was continued for 8 weeks, the sows and pigs being divided for convenience into 4 uniform groups. Lot 1 was fed corn meal and skim milk about 1:8, lot 2 corn meal and shorts 2:3, lot 3 corn meal and beef meal 2:1, and lot 4 concentrated feed and skim milk about 2:3, the concentrated feed consisting of corn meal, shorts, and beef meal 4:3:1. Before weaning the average daily gain per pig in the first month of the test was 0.4 lb., in the second 0.47 lb., and in the third month 0.69 lb.; in the first month after weaning it was 0.71 lb. and in the second month 0.81 lb.

The amount of feed required per pound of gain and its cost were calculated in every case, and "the amount eaten by the sow while she was suckling the pigs is always charged to the pigs, less the sow's feed of maintenance." On this assumption a pound of gain required from 1.7 lbs. grain and 6.1 lbs. skim milk in the first month of the whole period to 3.9 lbs. of grain and 6.2 lbs. of skim milk in the last month, the cost of a pound of gain ranging from 2.21 cts. to 3.96 cts.

With 2 pigs from each litter, the feeding test was continued on the same rations as before for 12 weeks, that is, until the pigs were ready for slaughter. The first 4 weeks of this period the average net gain per pig was 29.1 lbs. and for the last 4 weeks it was 32.4, the cost of a pound of gain being 3.19 cts. and 4.20 cts., respectively. The corresponding values for the first 4 weeks of the nursing period were 8.8 lbs. and 1.17 cts., and for the test as a whole 22.1 lbs. and 2.8 cts. per month. On the basis of these figures the author calculates that on an average it requires 2.77 lbs. of digestible nutrients, at a cost of 3.12 cts., to produce a pound of gain with pigs from birth to maturity, the nutritive ratio of the ration being 1:3.99.

At the close of the test the pigs were slaughtered and the live weight and dressed weight, weight of internal organs, and other similar data recorded. The breaking strength of the thigh bones was also tested and it was found that there was a marked difference depending upon the character of the rations fed, the bones of the pigs fed corn and beef meal having a breaking strength of 1,200 lbs., which was about 8 times the weight of the body. Those of the pigs fed corn and shorts had a breaking strength of 835 lbs. or 4.3 times the average weight of the body, and the bones of the pigs fed corn and skim milk 977 lbs. or 3.8 times the average weight of the body, and of the group fed the grain and beef meal ration it was 1,169 lbs. or 5.2 times the average weight of the body.

"From these data it would seem that the beef meal in the rations had a marked influence on the strength of the bones in the different pigs, while the rations containing a large proportion of corn seemed to have the effect of greatly weakening the bones of the pigs to which they were fed."

The results obtained in this test are discussed at considerable length in relation to breeds and rations fed.

Corn, wheat and soy-bean meal with skim milk for pork production, A. M. Soule and J. R. Fain (*Tennessee Sta. Bul. Vol. XVI, No. 3, pp. 35–48, figs. 5*).—Two tests, the first of 60 days' and the second of 77 days' duration, were undertaken for the purpose of studying the value of corn meal alone and fed with different amounts of skim milk, and also the effects of substituting wheat meal and soy-bean meal for part of the corn meal when combined with skim milk.

In the test made in 1892 each lot contained 3 grade Chester White pigs, while in the test made in 1893 each lot contained 4 grade Berkshires. The rations fed and the general experimental conditions were practically the same in the 2 tests, lots 1, 2, 3, 4, and 7 being fed corn meal and wheat meal, 2:1, with skim milk, the proportion of grain to milk ranging from 1:3 in the case of lot 1 to 1:12 in the case of lot 4. In each case lot 5 was fed corn meal only; lot 6 corn meal and skim milk, 1:8; and lot 8, corn meal and soy-bean meal, 2:1, with skim milk in the proportion of 1 part grain to 8 parts milk.

The gains on corn meal, wheat meal, and skim milk in 1892 were practically uniform, being about 1.5 lbs. per head per day. With lot 8 (corn meal, soy-bean meal, and skim milk) the average daily gain was 1.6 lbs. per head per day. With lot 5 (corn meal only) it was 0.9 lb., and with lot 6 (corn meal and skim milk) 1.7 lbs. In 1903 the gains on corn meal, wheat meal, and skim milk ranged from 1 lb. per head per day with lot 7 (grain and skim milk 1:8) to 1.3 lbs. with lot 3 (grain and skim milk 1:9). With lot 6 (corn meal and skim milk) and with lot 8 (corn meal, soy-bean meal and skim milk) the average daily gain in each case was 1 lb. per head per day, and with lot 5 (corn meal only) 0.24 lb.

Considering the averages for the 2 years, the smallest gain, 0.5 lb. per head per day, was made with lot 5 (corn meal only), and the greatest gain, 1.4 lbs., with lot 3 (grain and skim milk 1:9), and lot 4 (grain and skim milk 1:12). The largest amount of grain per pound of gain, 4.1 lbs., was required on corn meal alone. When grain was fed with skim milk the amount required per pound of gain ranged from 1.4 lbs. with lot 4 (grain and skim milk 1:12) to 2.2 lbs. with lot 1 (grain and skim milk 1:3). In the latter case the smallest quantity of skim milk, 6.5 lbs., was required, and in the former the greatest amount, 16.4 lbs. With lot 1 the gains were made most economically, costing 4.4 cts. per pound, while with lot 5 the gain was most expensive. The profit ranged from $3.38 per lot on soy beans to $7.63 per lot on grain and skim milk 1:3.

"The cost of soy beans in the case of the [former] group was probably responsible for the small profit shown, which indicates the importance of studying and utilizing those grains best adapted for the cheap production of pork."

At the conclusion of the test the pigs were slaughtered, the weight of the carcass and other data being recorded for lots 5 to 8 in the first test and for all the lots in the second test.

"The best slaughter tests were made by the hogs receiving corn meal, wheat meal, and skim milk, there being little choice between the 4 groups; while those receiving corn meal and soy-bean meal were somewhat lower. That these hogs were not so profitable as those of higher grade is shown by the fact that certain well-bred animals, reared and fed on the University farm, sold and slaughtered at the same time, dressed from 81 to 83 per cent, a difference of from 2 to 10 per cent in favor of the better-bred hogs."

Peptone feed tested with pigs, W. Müller (*Fühling's Landw. Ztg., 52 (1903), No. 17, pp. 597–604, dgm. 1*).—Using 4 lots of 4 pigs each, the value of a so-called peptone feed, with or without meal, was compared with meal alone and with bran and a molasses mixture, potatoes forming a part of the ration in all cases. The pep-

tone feed used is a slaughter house by-product made from the partly-digested contents of the paunches of cattle. The pigs given this feed made the largest percentage gains in the 66 days of the test and at the least cost.

The American saddle horse, J. B. CASTLEMAN (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 62–78, pls. 5*).—The origin and development of the American saddle horse, size, and other requirements are discussed.

Fattening horses for market, W. J. KENNEDY (*Wallaces' Farmer, 28 (1903), No. 42, p. 1363*).—The fact that increased profits may attend fattening horses before marketing them is pointed out, a full grain ration with an abundance of forage being recommended for the purpose. The author states that many find clover a satisfactory coarse fodder, and corn, oats, and bran a good grain mixture. Cooked or steamed grain twice a week is recommended with some oil meal or flaxseed added. Glauber salts once a week is also useful, especially as the horses are given little or no exercise. Feeding horses 4 or 5 times a day is recommended. "Horses on full feed should gain from 3 to 5 lbs. per head per day."

Distribution and magnitude of the poultry and egg industry, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 149–213*).—A statistical article based largely on reports of the last census. A part of this article has been noted from another publication (E. S. R., 15, p. 291).

DAIRY FARMING—DAIRYING.

Studies in milk production, W. L. CARLYLE and F. W. WOLL (*Wisconsin Sta. Bul. 102, pp. 88, figs. 10, dgm. 1*).—During the period from the fall of 1898 to May, 1903, complete records were obtained of 38 cows, comprising 8 grade and 4 pure-bred Jerseys; 9 grade Guernseys, 1 grade and 4 pure-bred Holsteins; 8 grade and 3 pure-bred Shorthorns; and 1 grade Red Polled cow. The records obtained during the first 2 years of this period were discussed in previous reports of the station (E. S. R., 12, p. 83; 13, p. 81). The main part of the data previously presented, however, is included in this bulletin, which contains illustrations and descriptions of the cows, detailed data for the food consumption and the production of each, and a discussion of the results from different standpoints. "The primary object of the investigation has been to ascertain the capacity of the various cows for a large and economical production of milk and butter, and to study the system of feeding which was required to reach this end, in case of the individual cows in the herd. The general plan of feeding adopted has been the one which we consider the fundamental requirement in the successful management of a modern dairy, viz. to feed each cow as much rough feed as she will eat up clean and, in addition, such amounts of the available common concentrated feeds as she will give returns for in production of milk without any material change in live weight, the character and amounts of grain feed being therefore adjusted according to the peculiar characteristics of each cow." The average annual production of the 38 cows for 4 years was 7,340 lbs. of milk, and 307 lbs. of butter fat, equivalent to 370 lbs. of butter per head. The main results of the work as summarized by the authors are as follows:

"(1) The average annual yield of milk for the various cows in the herd ranged from 10,960.3 to 4,033 lbs., the production of fat ranged from 474.73 to 183.64 lbs., and the net profit returned by the cows from $79.31 to $19.59. The highest average production per year for any cow in the herd was that of the Jersey cow, Gold, which is credited with a production of 7,621.6 lbs. of milk and 474.73 lbs. of butter fat, and a net profit (value of butter and skim milk minus cost of food) of $79.31. This cow also produced the maximum amount of butter fat of any cow in the herd during 365 consecutive days, viz, 502.12 lbs., and returned the highest net profit of any cow during this time, with $84.55. Twenty-two of the cows produced more than 300 lbs.

of butter fat per year, on the average, and 25 out of the total number of 38 cows yielded a profit of $40 or more, over the cost of the food eaten.

"(2) The average production of 10 cows during their year of maximum production was 376.51 lbs. of butter fat, and their average net profit $58.21. During the year following their maximum production the same cows yielded, on the average, 281.47 lbs. of butter fat and a net profit of $40.82. Cows making exceptionally high records for a single year are almost certain to require a portion of the succeeding year for recovery, and will therefore give a much smaller production and lower net profit for that year.

"(3) Cows belonging to the different breeds represented in the herd yielded, on the average, as follows: Red Polled (1 cow), 461.81 lbs. of butter fat per year; Holstein (5 cows), 351.62 lbs.; Guernsey (9 cows), 319.35 lbs.; Jersey (12 cows), 301.13 lbs., and Shorthorn (11 cows), 281.73 lbs. The average net profit returned by cows of these breeds decreased in the same order from $56.70 (Red Polled) to $36.09 (Shorthorn).

"(4) The cows in the university herd may be considered as representing three different types of cows, viz, extreme dairy type, large dairy type, and dual-purpose type. If the results for cows of the same type be averaged, we find that the large dairy cows lead in average annual production of fat with 325.23 lbs., the extreme dairy cows being next with 310.21 lbs., and the dual-purpose cows last with 292.99 lbs. The rank of the cows, according to net profit returned, decreased in the same order from $45.31 for the large dairy cows, to $37.82 for the dual-purpose cows. In the opinion of the authors, cows of the large dairy type of the particular breed suiting the fancy of the farmer and weighing, say 1,000 lbs. or more, will, everything considered, be found the most satisfactory for the dairy farmer; cows of the dual-purpose type, on the other hand, are to be recommended for farmers who wish to utilize more or less of the rough feed produced on their farms for raising beef for the market, in conjunction with keeping a number of cows for milk production. It is not, in our opinion, the part of wisdom for our dairymen to select small refined cows with a square habit of body in an extreme degree as the most desirable type of dairy cow.

"(5) Cows of exceptional merit as producers were found within all the different types or breeds represented in our herd; the main reliance in selecting cows for the dairy herd should therefore be placed, not on any particular type or breed, but on individual excellence for dairy purposes. The best indications of true merit in dairy cows are a large digestive capacity, as evidenced by great depth and length of body, and a general refinement in conformation, as shown by fineness of bone in the legs, a clean-cut feminine head, a long and fine neck, light shoulders, prominent backbone, a fine, elastic quality of udder, and a well-developed milk vein system. Minor points are fine, silky hair, thin unctuous and movable skin, large bright eyes, and a general sprightly appearance.

"(6) The milk produced by the cows decreased somewhat in quality as the cows advanced in age. The average per cent for the year with cows in our herd came as follows: 1st year, 4.49 per cent; 2d year, 4.40 per cent; 3d year, 4.29 per cent, and 4th year, 4.17 per cent.

"(7) The flow of milk decreased, on the average, for all cows in our herd and for 4 years, with 8 per cent for each month during the progress of the lactation period, and the production of butter fat decreased with 7.3 per cent for each month.

"(8) Our dual-purpose cows maintained their flow of milk during the progress of the lactation period, as well or better than cows of the dairy types; the shrinkage in the production of milk between the third and the fortieth weeks of the lactation period for the same cows was 44 per cent for the extreme dairy cows, 59 per cent for the large dairy cows, and 49 per cent for the dual-purpose cows, and in the production of fat for the same types of cows, 43, 60, and 46 per cent, respectively.

"(9) The rations fed to the best producers in the herd during the winter period contained, on the average, 25.28 lbs. of dry matter, 2.05 lbs. of digestible protein, 15.22 lbs. of digestible carbohydrates and fat, and had a nutritive ratio of 1 : 7.4. The low-producing cows received, on the average, 21.14 lbs. of dry matter, 1.56 lbs. of digestible protein, and 12.20 lbs of carbohydrates and fat (nutritive ratio, 1 : 7.8), while intermediate figures were obtained for the cows with a medium production.

"(10) Only 10 cows out of a total of 33 required more than 2 lbs. of digestible protein in their average daily winter rations under our system of feeding for a large and economical production. The case of the cow Ella, weighing about 1,000 lbs., is especially worthy of note, from the fact that she received only 1.48 lbs. of digestible protein per day in her winter ration, and 12.19 lbs. of digestible carbohydrates and fat (nutritive ratio, 1:8.2), and produced 343 lbs. of butter fat yearly, as the average for 4 years. According to our present knowledge, we believe that only cows of large capacity will give economical returns for a supply of more than 2 lbs. of digestible protein per day, under the conditions present in the Northwest; and in the majority of cases with good average dairy cows, a supply somewhat less than this may be found most economical."

Soiling crops for dairy cows in Wisconsin, W. L. Carlyle, J. R. Danks, and G. E. Morton (*Wisconsin Sta. Bul. 103, pp. 14, figs. 3*).—A comparison is made of the average monthly yield of milk for 4 years of 15 farmers' herds and the average monthly yield for the past 2 years of the university herd, which was fed in part on soiling crops. In the case of the farmers' herds a rapid falling off from the highest yield in June to almost the lowest yield for the year in August is shown. The milk production of the university herd reached its maximum in April, remained almost constant until June, after which it decreased gradually and reached its lowest point in October.

The results of culture tests with various soiling crops at the university farm from 1900 to 1903 are presented in the following table:

Average data obtained in culture tests with soiling crops.

Variety of crops.	Number of crops averaged.	Seed per acre.	Dates of sowing.	Period of growth.	Average yield per acre.		Digestible nutrients in 100 lbs. gross yield.	
					Forage.	Dry matter.	Protein.	Carbohydrates.
		Lbs.		*Days.*	*Tons.*	*Tons.*	*Lbs.*	*Lbs.*
Fall rye	2	140	Sept. 10	248	8.41	2.0	2.1	14.2
Hulless barley	1	120	Apr. 2	64	10.68	2.2	1.9	10.3
Alfalfa	1	20	....	72	16.5	4.7	3.9	12.8
Red clover	2	15	....	....	10.0	2.9	2.9	15.0
Peas and oats	4	150	Apr. 11–May 4	70	9.68	3.4	1.8	7.2
Oats	2	88	Apr. 14–May 4	75	9.38	3.6	2.6	21.4
Vetches and oats	2	148	Apr. 26	71	6.95	....	....	....
Dent corn	1	....	May 10	85	12.20	2.6	1.0	12.6
Rape	2	2.5	May 2–July 11	67	26.83	4.2	1.5	8.6
Sweet corn	2	35	May 16–May 26	102	24.39	5.1	1.5	13.7
Sorghum	4	54	May 26–June 9	86	29.83	6.1	.6	13.2
Giant fodder corn	1	35	May 19	86	23.30	4.8	1.0	12.6
Millet	2	....	June 15	62	12.19	3.0	2.0	17.0
Rye and vetches	1	140	....	....	10.6	....	....	....
Flint corn	....	35	May 16	86	15.52	3.1	1.0	12.6

The discussion of the subject considers variety, culture, yield, value, feeding stage, and cost of production of the crops, and a succession of the same that would supply succulent feed at all times. Nearly all of the crops grown are most palatable and satisfactory when fed at or a little before full bloom. Thick seeding in general gave a much greater yield and a better quality of forage than thin seeding. In 1901, sowing 25 lbs. sorghum seed per acre with alternate spouts of the drill open, and 25 and 50 lbs. with all the spouts open yielded, after a period of 82 days, 17,552, 21,200, and

24,216 lbs. per acre, respectively. In 1902 an acre of sorghum sown May 26 and harvested September 4 yielded 40.4 tons. Early Amber sorghum from northern-grown seed is considered the most valuable soiling crop for Wisconsin. Evergreen sweet corn gave almost as good results as sorghum.

It was found that cows fed on soiling crops alone without pasture consumed from 75 to 100 lbs. of forage daily.

Experiments with gluten meal for milch cows, H. Isaachsen and H. Solvsberg (*Norsk Landmandsblad, 22 (1903), No. 12, pp. 153–157*).—This is an account of a feeding experiment with 20 milch cows conducted at the agricultural college of Norway, in which the effect of feeding 2 kg. of gluten meal per head daily, in place of corn and fish meal, was studied. The gluten meal ration produced 0.2 kg. less milk per head daily than the regular ration fed to the herd, but the fat content of the milk was increased 0.12 per cent. The authors conclude that 100 kg. of gluten meal was worth 48.2 cts. more than 97 kg. of equal parts of corn and fish meal.—F. W. WOLL.

On the production of milk, B. Boggild (*Mälkeritid., 16 (1903), Nos. 31, pp. 535–544; 32, pp. 551–559, figs. 3; 33, pp. 569–575, figs. 2; 34, pp. 585–593, figs. 7; 35, pp. 601–608*).—Notes on lectures on dairying delivered at the Royal Danish Agricultural and Veterinary College at Copenhagen.

Recent experimental inquiry upon milk secretion, C. D. Woods (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 234–253*).—This is a popular summary of the more important data and conclusions relating to the subject of milk secretion, and is reprinted from the report of the Connecticut State Board of Agriculture for 1900.

Variations in the proteids of cow's milk during lactation, A. Trunz (*Ztschr. Physiol. Chem., 39 (1903), No. 5, pp. 390–395*).—This investigation was begun by G. Simon,[a] who reported some of the data along with a discussion of methods of analysis. The present article completes this data and discusses briefly the results.

The milk of 2 cows was analyzed at frequent intervals during the course of lactation. Omitting the colostrum period, the protein content of the milk of one of the cows was about 3 per cent for the first 7 months, after which it gradually increased to 5.54 per cent. The albumin and casein bore a ratio averaging 1:3 for the entire period. The protein content of the milk of the other cow was about 3.5 per cent for the first 9 months, after which it increased to 6.29 per cent. The ratio of albumin to casein was 1:5.2.

Observations on several breeds showed no constant difference in the ratio of albumin to protein. This variation is pointed out as of practical importance inasmuch as milk with a relative and absolute high content of albumin is best suited for infant feeding, while the reverse is true for cheese making.

Ulander's milk strainer, L. F. Rosengren (*Nord. Mejeri Tidn., 18 (1903), No. 17, pp. 223–225, figs. 2*).—In a series of trials this strainer removed all but 3.52 mg. of the impurities in 20 liters of milk, as compared with 22.18 mg. left by a common strainer.—F. W. WOLL.

Comparative skimming trials with milk from old and new milch cows, L. F. Rosengren (*Nord. Mejeri Tidn., 18 (1903), No. 13, pp. 173–174*).—The trials reported in this paper were conducted at the Alnarp Dairy Institute, and were made with milk from either old or new milch cows, or mixtures of the two kinds of milk. The skimming was done with an Alpha Dairy separator, having a stated capacity of 200 kg. per hour, the crank being turned 52 times per minute. The skimming temperatures ranged from 30 to 50° C.

The skim milk from the milk produced by old milkers had uniformly a higher fat content than that from milk of fresh milch cows, although the difference was not great when the amount of milk run through the separator was reduced by one-fourth

[a] Ztschr. Physiol. Chem., 33 (1901), No. 5–6, pp. 466–541.

to one-third. By reducing the flow of milk to this extent the fat content of the skim milk from old milkers was reduced to about one-tenth, when the separation took place at 50° or above.—F. W. WOLL.

A hitherto unexplained cause of poor skimming, C. BARTHEL (*Landtmannen, 14 (1903), No. 20, pp. 311–315; Nord. Mejeri Tidn., 18 (1903), No. 18, pp. 235, 236*).—It was found that milk which was emptied out of a pasteurization apparatus by means of a steam injector gave a skim milk much richer in fat when separated than milk which was run through the pasteurization apparatus without pressure; the fat contents of the 2 kinds of skim milk, as determined by the Gottlieb method, being on an average 0.31 and 0.13 per cent, respectively.

In investigating the subject the author found that violent agitation of the milk at separating temperatures caused a division of the fat globules, the minute globules remaining in the skim milk in the process of separation. Milk churned for 5 minutes at 50° C. and afterwards pasteurized at 75°, gave skim milk containing 0.69 per cent of fat, against 0.12 per cent found in skim milk from milk not previously churned. When the milk was churned at a very low temperature (5.5°) for 5 minutes, a similar fat content was obtained as in the case of the skim milk from milk not previously churned. Similar results were obtained in a number of different trials.—F. W. WOLL.

Influence of pasteurizers on clean skimming, T. BERG (*Landtmannen, 14 (1903), No. 29, pp. 460–462*).—The results of the work by Barthel, noted above, have been corroborated by the author. In experiments with a steam turbine pasteurizer no increase in the fat content of the skim milk was observed when the stirrer was turned at a speed of 200 to 250 revolutions per minute; but with 300 to 500 revolutions an increasing amount of fat remained in the skim milk, the average percentages in the 2 cases being about 0.118 and 0.225 per cent. In trials with milk pumps no appreciable difference was obtained in the fat content of the skim milk, whether the milk passed through the pump at 50 or at 17°.—F. W. WOLL.

Influence of clean skimming on the yield of butter, T. BERG (*Nord. Mejeri Tidn., 18 (1903), No. 22, pp. 301–303*).—Experiments conducted by the author showed that a decrease in the fat content of the skim milk from 0.223 to 0.147 per cent increased the amount of butter obtained from 50 kg. of milk from 1.691 to 1.734 kg., or 0.043 kg., while a further decrease in the fat content of the skim milk from 0.147 to 0.092 per cent increased the yield of butter only 0.022 kg. In the former case the difference in the fat content of the buttermilk was 0.086 per cent, in the latter 0.039 per cent.

There is apparently a limit below which it does not pay to skim the milk; the nearer this is reached the more expensive the reduction in the fat content of the skim milk becomes. It is shown by the results published in the paper that 0.01 kg. of butter may be obtained per 100 kg. of milk for every 0.01 per cent of fat more or less in the skim milk.—F. W. WOLL.

Influence of clean skimming on the yield of butter, L. F. ROSENGREN (*Nord. Mejeri Tidn., 18 (1903), No. 23, pp. 307–309*).—The same conclusion was reached as in the work by Berg, noted above, that somewhat more fat is, as a rule, left in the buttermilk by close skimming; but that this is much less than the amount going over into the butter. Of the 88.3 gm. which the cream from 100 kg. of milk in one series of trials exceeded that in another series, 12 gm. remained in the buttermilk while 76.3 gm. went into the butter. The closer skimming reduced the fat content of the skim milk 0.0984 and increased the yield of butter 99.6 gm. Calculated per 100 kg. new milk, a decrease of 0.01 per cent in the fat content of the skim milk is equivalent to an increase of 10 gm. in the yield of butter, even if the milk is skimmed so as to leave only 0.05 per cent of fat in the skim milk.—F. W. WOLL.

Researches on the fermentation of milk, H. TISSIER and P. GASCHING (*Ann. Inst. Pasteur, 17 (1903), No. 8, pp. 540–563*).—In connection with a study of the bac-

terial flora of the alimentary tract the authors have investigated the organisms ordinarily concerned in the putrefaction of meat and milk. In the work reported in this article samples of milk were obtained from different sources and permitted to undergo spontaneous fermentation, examinations being made at frequent intervals for a period of about 10 months. Notes are given on the 13 species of bacteria and fungi quite constantly found, and *Bacillus lactopropylbutyricus nonliquefaciens* n. sp., is described in detail.

The bacteria constantly found were divided into 2 groups designated "simple" and "mixed" depending upon their action upon the proteids alone or upon the proteids and carbohydrates simultaneously. The mixed ferments included staphylococci, a streptococcus identified with the Enterococcus of Thiercelin, *Bacillus acidiparalactici*, *B. lactopropylbutyricus*, and *B. coli communis;* and the simple ferments, *B. mesentericus*, *B. subtilis*, *B. putrificus*, *B. fæcalis alcaligenes*, *Proteus vulgaris*, and *P. zenckeri*. In sterilized milk the mixed group gave rise to 2 principal fermentations, lactic, due to the Enterococcus, *B. coli communis*, and *B. acidiparalactici*, and butyric, due to *B. lactopropylbutyricus*. The simple ferments caused a destruction of the casein until their growth was arrested by the presence of acid.

The process of spontaneous putrefaction was found to be uniform in all samples examined. The Enterococcus was the predominant species at first which, with *B. coli communis*, produced an acidity of about 0.2 per cent, stopping proteolytic action and causing coagulation of the milk. *B. acidiparalactici* continued the destruction of the lactose, producing dextrolactic acid. *B. lactopropylbutyricus* then developed, producing inactive lactic acid, but especially propionic acid and butyric acid. All bacterial growth was stopped at this stage by the presence of 0.4 to 0.6 per cent of acid, when the development of *Oidium lactis* and *Rhizopus nigricans* caused a reduction in the amount of acid and also a decomposition of the remaining lactose and of the casein. Finally the simple ferments completed the breaking down of the casein and its products.

In the absence of predisposing causes the ordinary bacteria concerned in the putrefaction of milk and meat are not believed to cause digestive disturbances. This view is supported by the results of several experiments made by the authors with animals and men, and here reported.

Studies on the antagonism between the bacteria of the lactic-acid group and the Bacillus subtilis group, F. W. Bouska (*Landw. Jahrb. Schweiz, 17 (1903), No. 6, pp. 349–357; Rev. Gén. Lait, 3 (1903), No. 1, pp. 1–11*).—Bacteria of the 2 groups were grown together under different conditions. Both types developed rapidly during the first few hours, the lactic-acid bacteria, however, developing more rapidly. Later the development of *Bacillus subtilis* stopped, their number gradually decreasing until in old cultures only a few were found.

The growth of the lactic-acid bacteria on the contrary continued until about 0.8 per cent of lactic acid was formed, when their multiplication stopped. In a medium containing sugar the antagonistic power of the lactic-acid bacteria is believed to be due, for the most part, to the acid produced. In general, however, the rapidity of their growth gives them an advantage over the other forms. In the absence of sugar they are also capable of supplanting *B. subtilis* and preventing the growth of this species. It is believed to be very probable that the lactic-acid bacteria produce other products than acid inhibiting the growth of *B. subtilis*.

Hygiene and dairying, K. Gappikh (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 9, pp. 960–980*).—The author discusses in a general way the relation between the dairy industry and public hygiene, and concludes that the attention of dairymen should be called to the urgent necessity of observing greater precautions in the conduct of this business from a sanitary standpoint.

Effect of pasteurization temperatures on tubercle bacilli in milk, J. Svensson (*Landtmannen 14 (1903), No. 18, pp. 273–276*).—In an apparatus in which the

milk was heated rapidly by being in a thin layer, a temperature of 80° C. for 2 minutes was sufficient to destroy the tubercle bacilli. This was not true in experiments in which the temperature was 75° C.—F. W. WOLL.

On the water content of butter, L. F. ROSENGREN (*Landtmannen, 14 (1903), No. 33, pp. 520–527*).—A discussion of the various factors influencing the water content of butter, with the results of a number of experiments bearing upon this point.—F. W. WOLL.

Report of Swedish butter exhibits, 1902, N. ENGSTRÖM (*Meddel. K. Landtbr. Styr. [Sweden], 1903, No. 84, pp. 53*).—The report presents the usual annual summary of the butter exhibits in Sweden. The number of creameries which took part in the exhibits was 346. The total number of tubs of butter exhibited and scored was 1,491. The main results of the examination of the butter as to scores, water content, loss of brine on storage, etc., are given in the report; as well as the average results of examinations of skim milk, buttermilk, and butter made during the year.—F. W. WOLL.

The rôle of the lactic-acid bacteria in the manufacture and in the early stages of ripening of Cheddar cheese, H. A. HARDING (*New York State Sta. Bul. 237, pp. 165–180*).—In the introduction to this bulletin brief explanations are given concerning 3 theories of cheese ripening namely, (1) that ripening is due mainly, if not entirely, to lactic-acid bacteria, (2) that ripening is brought about by liquefying bacteria, and (3) that the breaking down of the casein is largely due to the enzyms naturally present in milk. The results of some experimental work are included, and other investigations at the New York State Station are referred to in support of the views which are expressed concerning the rôle of lactic-acid bacteria in the ripening of cheese.

In factory milk lactic-acid bacteria are always present, and at the time of souring commonly make up more than 95 per cent of the total number. The rapid development of the lactic-acid bacteria checks the growth of other species, due to the conversior of milk sugar into lactic acid. The action of this acid has been found in practice and shown experimentally to hasten the curdling action of rennet. Investigations have shown that the lactic acid combines with paracasein to form 2 salts, one the unsaturated paracasein monolactate, insoluble in water but soluble in dilute salt solutions, and the other the saturated paracasein dilactate, insoluble in both water and dilute salt solutions.

That paracasein monolactate is formed in cheese curd by lactic-acid bacteria was shown experimentally as follows: Fresh milk was curdled by rennet in the presence of ether to prevent bacterial growth, and the curd was washed with water to remove the greater part of the sugar. After sterilization portions of the curd were inoculated with lactic-acid bacteria, with and without the addition of sugar. Without the addition of sugar only very small quantities of paracasein monolactate were formed, while with the addition of sugar considerable amounts were produced.

In normal cheese during the first week after it is made it is stated that from one-half to three-fourths of the nitrogen is found in the form of paracasein monolactate. In forming the amount of monolactate ordinarily present the bacteria use up an amount of sugar equal to from 2 to 4 per cent of the weight of the cheese. The presence of the monolactate is considered essential to the digestive action of the rennet enzym. As the part played by the enzyms of the milk itself is not confined to the first stages of ripening, this subject is to be treated in a separate bulletin. The action of rennet enzym is not believed to extend much beyond the formation of peptones, leaving the formation of the simpler nitrogenous compounds characteristic of a ripened cheese to be explained in some other manner.

Some changes in a ripening cheese, F. H. HALL ET AL. (*New York State Sta. Buls. 214, 215, 219, 231, 233, 236, 237, popular ed., pp. 14*).—This bulletin summarizes the more important points brought out in recent investigations at the station, and

reported in bulletins already noted (E. S. R., 14, pp. 67, 545, 805, 1115; and 15, pp. 400, 508).

Shrinkage of cold-cured cheese during ripening, S. M. BABCOCK, H. L. RUSSELL, and U. S. BAER (*Wisconsin Sta. Bul. 101, pp. 30, figs. 11*).—This is essentially the same as that portion of the report of cooperative work previously noted (E. S. R., 15, p. 398), which deals with the effect of cold curing upon the loss in weight of cheese.

The duration of the life of the tubercle bacillus in cheese, F. C. HARRISON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 217–233*).—This is a translation of articles previously noted (E. S. R., 12, p. 985; 14, p. 292), with an introductory statement by H. E. Alvord.

Examination of Babcock test apparatus (*Connecticut State Sta. Rpt. 1902, pt. 4, p. 423*).—During the year 600 pieces of glassware were tested, of which 1 per cent was found inaccurate.

Statistics of oleomargarine, oleo oil, and filled cheese, 1900–1902, R. A. PEARSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 274–292*).

Preparation of condensed milk by means of a centrifuge (*Chem. Ztg., 27 (1903), No. 78, p. 964*).—The milk in a thin layer is brought into contact with a cold surface, revolved at the right speed to freeze the water out of the milk, and at the same time to throw out the condensed product. The process is covered by German patents.

VETERINARY SCIENCE AND PRACTICE.

Cytotoxic sera, WANDA SZCZAWINSKA (*Arch. Parasit., 6 (1902), No. 3, pp. 321–358*).—The author presents a general discussion of cytotoxic sera, including the method of preparation, their properties and actions, and the various practical uses to which these sera have been put. It was found that specific toxic sera could be obtained either from isolated cells or from groups of cells in the form of a tissue, and that these sera owe their specific action to the presence of 2 substances, an intermediary body and complement. As a rule these sera exercise a toxic effect when given in large doses, a slightly injurious effect in medium doses, and a stimulating action in small doses.

Precipitating sera, H. VALLÉE (*Rev. Gén. Méd. Vét., 1 (1903), No. 1, pp. 9–18*).—If a given species of animal is repeatedly inoculated with albuminous matter of another species, the serum of the inoculated animal soon acquires the power of precipitating in vitro-albuminous solutions coming from the second species. Notes are given on the practical application of these facts in the examination of meat and milk and in the study of animal diseases.

The absorption of tetanus antitoxin in wounds and the immunizing action of dry antitetanus serum employed in the treatment of wounds affected with tetanus, A. CALMETTE (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 19, pp. 1150–1152*).—During experiments carried out by the author it was found that guinea pigs could easily be immunized against tetanus by causing absorption of small quantities of antitetanus serum in wounds involving the whole thickness of the skin. Good results, however, are usually not obtained from rubbing the wound with a brush dipped in the liquid serum. Positive results, on the other hand, were almost always obtained when a small quantity of finely-pulverized dry serum was sprinkled into the wound.

Experiments were also conducted for the purpose of testing the action of dry antitetanus serum when placed in the wound simultaneously with living tetanus bacilli. In a test during which 10 guinea pigs were inoculated and not treated and 10 others inoculated and treated as just indicated, with dry antitetanus serum, the latter 10 animals all failed to develop tetanus while the former 10 died after the usual course of the disease.

Intracerebral injections of various kinds of virus, K. BREIDERT (*Fortschr. Vet. Hyg., 1 (1903), No. 5, pp. 160–167*).—Extensive experiments were made, principally on rabbits, for the purpose of determining the comparative advantages of making intracerebral injections in the diagnosis of infectious diseases. The organisms employed in these experiments included anthrax bacilli, *Staphylococcus pyogenes aureus*, *Bacterium avicidum*, swine-plague bacteria, and the bacilli of swine erysipelas. The author concludes as a result of these experiments that for the majority of pathogenic organisms which he has studied the brain substance is a very favorable nutrient medium and intracerebral injection brings about a fatal development of the disease within a shorter time than can be accomplished by subcutaneous injection. In the use of the intracerebral method of injection very minute quantities are sufficient to produce results. Cultures may be diluted so as to employ one-millionth or even one-billionth cubic centimeter with positive results. The method is therefore recommended in cases where it is necessary to obtain a diagnosis within a very short time. All of the organisms upon which the author experimented were found to develop readily in the brain substance, with the exception of that of swine erysipelas.

The pyogenic bacteria of cattle, O. KÜNNEMANN (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1–2, pp. 128–157, fig. 1*).—The author made elaborate comparative studies for the purpose of determining the relative frequency of various organisms in suppurative processes in cattle. The literature of the subject is critically reviewed. The green-colored multiple abscesses frequently found in the liver of cattle are due to the action of the necrosis bacillus, and this organism can always be found, but sometimes in small numbers. Suppurative pyelonephritis of cattle is characterized by the constant presence of *Bacillus renalis bovis* and *B. pyelonephritidis boum* in the purulent products and diseased kidney tissue.

In the pus of the abscesses in cattle, in 90 per cent of cases, the author found a bacillus not hitherto mentioned, which he names *B. pyogenes*. It is not identical with a similar bacillus described by Lucet. In 35 per cent of the cases observed by the author this bacillus was found alone in the pus, and in 55 per cent it was associated with other bacteria.

The bacterial flora of the intestinal canal of pigs, E. HEINICK (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 5, pp. 476–525*).—The author presents in a systematic manner lists of micro-organisms found in the small intestines, cecum, colon, and rectum of pigs. A number of known and unknown species of bacteria were found. Tables are given showing the results of inoculation of mice with various organisms found in different parts of the alimentary tract.

A number of tuberculous hogs were carefully examined for the purpose of determining whether tubercle bacilli were present in the intestines of such animals. No tubercle bacilli could be found, either as a result of microscopic examination or from inoculation of guinea pigs. As a result of the author's investigations, which were made upon 23 pigs, it was found that *Bacillus coli communis* and *B. lactis aërogenes* were the only organisms commonly found in the intestines of pigs. The bacillus of swine erysipelas was not found in a single instance.

Some experiments on the intravascular use of antiseptics, W. V. SHAW (*Jour. Hyg. [Cambridge], 3 (1903), No. 2, pp. 159–165*).—The author briefly reviews the literature relating to intravascular injection of antiseptics in the treatment of infectious diseases. The antiseptics employed were formalin, guaiacol, and chinosol, and the experimental animals were rabbits.

Preliminary experiments were made for the purpose of determining the maximum doses of these antiseptics which could be given without causing serious consequences in the experimental animals. The organism with which the rabbits were infected was *Bacillus pyocyaneus*. Additional experiments were also made with the tubercle bacillus. The experiments showed conclusively that the course of septicemia produced by *B. pyocyaneus* was not checked, but on the contrary was somewhat accelerated by the intravenous injection of the antiseptics already mentioned.

The formalin appeared to be absorbed rapidly by the tissues, otherwise it is believed that some antiseptic action would have been manifested, since the quantity of formalin injected stood in the ratio of 1 : 1,500 to the blood. Rabbits were inoculated with tuberculosis and subsequently treated with formalin in intravenous injections. The rabbits were given formalin in doses of 5 to 10 cc. The injection of formalin appeared to exercise no action whatever upon the development of the disease. The author concludes, therefore, that no advantages are derived from the intravenous use of antiseptics.

Transplantation of tumors, L. LOEB (*Arch. Path. Anat. u. Physiol.* [*Virchow*], *172* (*1903*), *No. 3, pp. 345–368*).—In the author's investigations rats were used as experimental animals, and numerous experiments were made in transplanting tumors from one animal to another. These tumors were placed in pure glycerin for a period of 17 to 24 hours and were then transplanted upon normal animals. In one set of experiments tumors developed upon 7 out of 13 inoculated rats.

The author concludes from his experiments that a micro-organism found just outside of the tumor cells, and small enough to pass through a Berkefeld filter, was probably not the cause of the sarcomata. A similar conclusion is drawn regarding another organism which closely resembles the tubercle bacillus. Detailed notes are given on the constancy and variability of the structure of sarcomata, the growth of these tumors, and the phagocyte action of sarcomatous cells.

During these experiments it was shown that sarcomatous cells may be removed from an infected animal and propagated for many generations on other animals by the process of transplantation.

The eye and its diseases, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 23* (*1903*), *No. 4, pp. 405–415, pls. 2*).—The author discusses the anatomy of the eye, with special reference to certain diseases to which it is subject in South Africa. These include conjunctivitis, recurrent ophthalmia, keratitis, trichiasis, bleeding fungus tumor, amaurosis, and a disease due to the presence of *Filaria lachrymalis* in the inner angle of the eye. In the author's experience keratitis has been most successfully treated by the use of nitrate of silver or by a mixture containing boracic acid, sulphate of zinc, fluid extract of belladonna, and water.

The poisoning of stock, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 23* (*1903*), *No. 4, pp. 390–399, pl. 1*).—In Cape Colony losses of cattle are sometimes suffered as the result of feeding on *Moræa polystachya.* The poisonous effects are rapidly manifested, and consist in acute gastro-enteritis accompanied with nervous prostration and collapse. Experiments were made in feeding *M. tenuis* and *M. polystachya* to steers; fatal results were produced with either plant when fed in quantities of 1½ lbs. Notes are also given on the poisonous effects of *Cestrum nocturnum*, oleander, *Nicotiana glauca*, stramonium, and other plants.

Report of State veterinarian, T. BUTLER (*Rpt. Comr. Agr. North Carolina, 1902, pp. 40–47*).—The author briefly relates the progress in animal industry in North Carolina during the past year, and gives an account of cattle quarantine, losses from Texas fever, methods of exterminating the cattle tick, staggers, tuberculosis, glanders, hog cholera, and blackleg.

Contagious diseases of animals in foreign countries, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 417–425*).—A statistical account showing the prevalence of the more important animal diseases, such as hog cholera, foot-and-mouth disease, glanders, anthrax, and sheep scab in Great Britain, Switzerland, France, German Empire, Belgium, Italy, Denmark, Netherlands, Norway, Sweden, and New Zealand.

Note on the correlation of several diseases occurring among animals in South Africa, A. EDINGTON (*Jour. Hyg.* [*Cambridge*], *3* (*1903*), *No. 2, pp. 138–154*).—In various parts of South Africa goats and sheep are extremely susceptible to the attack of a disease known as heartwater, and a high mortality in horses and mules is brought about by horse sickness.

The author studied the conditions under which this disease occurred for the purpose of determining if possible the means of infection. Some observations were made on a disease of cattle known by a number of different names, but usually by the term veld sickness. Experiments were made to determine the relation between horse sickness and veld sickness. Cattle were inoculated with the blood of horses affected with horse sickness, and as a result of these experiments it was found that cattle are somewhat susceptible to horse sickness. The disease produced in cattle by inoculation was indistinguishable from the form which occurs spontaneously among cattle. Detailed notes are given on the pathological anatomy of this disease.

The author succeeded also in transmitting heartwater from goats to cattle and horse sickness from horses to goats. The author concludes as a result of these studies that the contagion which causes horse sickness is responsible under certain conditions for the infection of various other species of domestic animals in South Africa.

Bovine tuberculosis and other animal diseases affecting the public health, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 332–353*).—This paper was read at the American Public Health Association at New Orleans, and deals with the inter-relationship between human and bovine tuberculosis. The literature of the subject is critically reviewed, and the conclusions are reached that great differences of virulence are observed in tubercle bacilli obtained from different human patients, and that some of these bacilli may be virulent for cattle and others not.

The author believes that tuberculosis may be transmitted from animals to man or from man to animals. An account is also presented of rabies, glanders, and anthrax, with special reference to the methods of control of these diseases and the prevention of the infection of man.

A discussion of the tuberculosis question, M. SCHOTTELIUS (*Beitr. Path. Anat. u. Allg. Path., 33 (1903), No. 1–2, pp. 32–50*).—A critical review of the recent controversy concerning the problem of the unity or duality of tuberculosis. The author outlines the positions of various authors on the subject. A number of experiments were made in testing the possibility of transmitting tuberculosis from man to animals. In these experiments 3 cows and 2 calves were used, the cows being 2 years old and the calves 4 to 5 weeks old at the beginning of the experiments. Each animal received from 50 to 60 gm. of human sputum in the milk or upon green fodder.

No alteration of temperature was observed in any of the animals during the course of the experiments. After a period of 4 months the 3 animals which had received virulent sputum were killed and examined. In all cases infection had taken place and was apparent in the various abdominal organs; the origin of the infection appeared to have been in all cases the lymphatic glands in the region of the pharynx. Positive results were obtained from the examination of diseased glands for the presence of tubercle bacilli.

The author believes that the sputum of tuberculous human patients is one of the important sources of tuberculosis in cattle.

The tuberculin test of cattle in Great Britain, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 550–553*).—Before March 1, 1900, cattle shipped to this country from Great Britain were inspected after arrival in the United States. Since disease frequently developed on shipboard in animals which did not appear to be affected at the time of shipment, great losses were suffered by cattle dealers.

In order to avoid inflicting these losses upon the individuals concerned, arrangements were made for the application of the tuberculin test in Great Britain to cattle about to be shipped to this country. The test is applied to all cattle over 6 months old, and has been made in Great Britain for the past 2 years. The inspector of the Canadian government and the inspector of the United States have made arrangements by which each government accepts certificates of the other's inspector.

During the years 1901 and 1902, 1,655 cattle were tested and 13.9 per cent were found to be tuberculous. The tests show the great prevalence of tuberculosis among pure-bred herds in Great Britain, but the cattle on the islands of Guernsey and Jersey were found to be practically free from tuberculosis.

Mammary tuberculosis in cattle, A. CONTE (*Rev. Gén. Méd. Vét., 1 (1903), No. 10, pp. 553–566*).—Statistics are presented showing the prevalence of mammary tuberculosis in cattle with special reference to the ratio which this form of the disease bears to general infection from tuberculosis. Notes are also given on the legal regulations which prevail in various countries regarding the sanitary control of milk from tuberculous cows.

Mammary tuberculosis in a mare, C. PARASCANDOLO and V. DE MEIS (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1–2, pp. 198–208*).—The author presents a detailed description of a case of mammary tuberculosis in a mare, with notes on the symptoms, course, and history of the disease. From pus obtained from the diseased tissue tubercle bacilli were isolated of sufficient virulence to cause the death of guinea pigs within a period of 2 weeks. The tubercle bacilli were found in small numbers inside of the tubercles in immediate connection with the giant cells.

Foot-and-mouth disease, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 391–410, pls. 13, map 1*).—This is a general account of the recent outbreak of foot-and-mouth disease in New England, with notes on the measures undertaken by the Bureau of Animal Industry and the affected States for its repression. Quarantine regulations were made prohibiting the shipment of cattle and sheep, other ruminants, or swine from one affected State to another, or out of any affected State into other States or foreign countries.

The measures for eradication adopted by the Bureau of Animal Industry were stringent, and involved the destruction of infected animals and disposal of the carcasses by deep burying or burning. Notes are given on the occurrence of the disease in Europe and the measures adopted in various countries for its control. In order to avoid imposing too great hardships upon cattle owners indemnities were paid for the animals which were destroyed.

Serum therapy for foot-and-mouth disease, E. NOCARD (*Rev. Gén. Méd. Vét., 1 (1903), No. 7, pp. 369–375*).—A general account is given of the various methods which have been used in combating this disease. It has been found that a serum can be produced which will confer an immediate beneficial effect upon treated animals, but the immunity produced by this treatment is only of short duration.

New systems of treatment for parturient paresis, E. LECLAINCHE (*Rev. Gén. Méd. Vét., 1 (1903), No. 2, pp. 65–71*).—A general review of the results obtained from the application of Schmidt's method and also from the use of the hot water, air, and oxygen methods in the treatment of parturient paresis. All of these methods bring about the same condition in the udder, viz, a dilatation of the sinus and the large milk ducts. The possibility of an undue diminution of pressure within the udder is thus avoided. In addition to infusions of iodid of potash or water, or the injection of air or oxygen, the author recommends in cases of cardiac weakness intrarectal injections of salt water in the proportion of 9 : 1,000 parts.

The etiology of so-called parturient blackleg, S. CARL (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 3–4, pp. 225–285*).—The author undertook a comparative study of cases of true blackleg and so-called parturient blackleg. The latter disease was studied with special regard to the symptoms and the pathological anatomy. Parturient blackleg is observed quite frequently in the Grand Duchy of Baden in regions where true blackleg is also apt to be prevalent.

As a rule the disease appears within from 2 to 5 days after calving, or in some cases not until a lapse of 2 to 3 weeks. The course of the disease is from 1 to 3 days and fatal results are observed in almost all cases. A bloody exudation is found in the thoracic cavity and also in the paricardial cavity. The symptoms and patho-

logical findings differ quite decidedly from those observed in cases of true blackleg, and a bacteriological study combined with inoculation experiments with white rats demonstrated that in all cases the organism of malignant edema was present, and that consequently the disease called parturient blackleg is nothing more nor less than malignant edema. Infection apparently comes about as the result of the penetration of the spores of this organism through the walls of the reproductive organs at the time of parturition.

Passive immunity in various forms of hemorrhagic septicemia, K. Z. Kleptzov (*Arch. Vet. Nauk, St. Petersburg, 33 (1902), Nos. 6, pp. 553–581; 7, pp. 685–700; 8, pp. 781–815*).—The literature relating to swine plague, hemorrhagic septicemia in cattle, and other related diseases is critically discussed, in connection with a bibliography including 67 titles. The author conducted an elaborate series of experiments for the purpose of obtaining immunizing sera and determining their preventive action. These sera were obtained from experimental animals according to the various methods generally employed in such work.

As a result of these experiments it is concluded that it is possible, by means of inoculation with the organisms of hemorrhagic septicemia, to obtain sera which exercise a preventive action even in comparatively small doses. A blood serum obtained from animals strongly immunized against a single species of bacteria from this general group exhibits immunizing power, not only against different races of this organism, but also against other organisms of the same group.

Hemorrhagic septicemia, M. H. Reynolds (*Minnesota Sta. Bul. 82, pp. 249–280, pls. 10*).—Hemorrhagic septicemia has been known in Minnesota for more than 2 years and during this time has occurred in 80 outbreaks on 52 farms, and with a loss of 551 cattle. Thus far it has been impossible to trace any connection between one outbreak and another, or to determine the method of infection.

The specific cause of the disease is considered to be *Bacillus bovisepticus*. This organism is not distinguished in cultural and morphological characteristics from the bacillus of swine plague. The disease appears suddenly and in acute cases results fatally within a short period. Some chronic cases recover. It has been frequently mistaken for anthrax, blackleg, cerebro-spinal meningitis, cornstalk disease, and parturient paresis. The disease is known to occur in many parts of the United States. It appears not to depend upon seasonal or climatic conditions.

During the author's investigations 17 cases were studied in detail. As a rule the temperature remains normal or subnormal. The prominent symptoms were those of cerebro-spinal meningitis. The symptoms, however, are not characteristic. Postmortem findings give more definite information. Subcutaneous hemorrhages are almost always present and are readily recognized from their sharply defined borders.

Detailed notes are given on a number of outbreaks which occurred at the experiment station or in various parts of the State. A description is also given of 1 case in a sheep, and of a supposed case of milk fever which was probably hemorrhagic septicemia. A number of outbreaks of cattle disease have occurred in various parts of the State, believed to have been hemorrhagic septicemia. No treatment has been discovered for this disease.

Hemorrhagic septicemia, J. Black (*Amer. Vet. Rev., 27 (1903), No. 3, pp. 202–205*).—The cases first observed by the author had been diagnosed as cornstalk disease. They occurred near St. Clair, Mich. Notes are given on the symptoms as seen in 5 affected cattle. Later other cases were observed in this neighborhood and the author believes that the disease was hemorrhagic septicemia. In 1 case recovery took place rapidly after the administration of potassium iodid. Hemorrhagic patches were observed under the skin in these cases.

The cornstalk disease, A. T. Peters and S. Avery (*Nebraska Sta. Rpt. [illegible], pp. 63–94*).—A special appropriation made by the Nebraska legislature in 1901 enabled the station officers to undertake an elaborate study of the cornstalk disease.

Various theories regarding the cause of cornstalk disease have been suggested, including impaction, insufficient salt and water, poisonous plants, corn smut, chinch bugs, bacteria, saltpeter, and other substances which have been assumed to be present in the cornstalks. The theory of impaction was found to be untenable, as was also the theory that disease was caused by a lack of salt and water. An examination of 434 reports concerning losses from this disease shows that the animals died in the field under quite different conditions.

The literature relating to the effect of corn smut on cattle is critically discussed, and the conclusion is reached that this can not be considered as the cause of the trouble in cattle. The Burrill disease of corn is also shown to have no connection with cornstalk disease. The symptoms of cornstalk disease closely resemble those of sorghum poisoning, and it is believed that some poison may yet be found in the cornstalks to account for the disease.

In the seasons of 1902 and 1903 the losses from the disease were not severe, but losses occurred only where corn was somewhat checked in its growth. Detailed reports are given of the conditions surrounding several outbreaks of the disease. It occurs most frequently in yearlings and 2-year-olds. The disease appears suddenly without premonitory symptoms and runs a course of from 24 to 36 hours. Postmortem examinations showed that the organs are usually in a normal condition. No satisfactory treatment can be recommended.

While moldy corn may have no injurious effects upon cattle, it is believed to cause disease and death in horses. This fact has been proved by feeding experiments and by other evidence obtained from natural outbreaks of the disease among horses.

An examination was made of 23 samples of stomach contents from cattle which had died of cornstalk disease. The presence of coniin, which is the active principle of water hemlock, was demonstrated in 1 case, and appeared to be present in 2 others. It was not considered, however, as being the cause of the disease. Tests were also made for the presence of minerals which might be connected with the disease. Various mineral elements were found, especially potassium in the form of potassium chlorid. Potassium in some form or other was found in all of the 16 stomachs which were examined for mineral salts. The amount of potassium found in the stomach, however, was in no case sufficient to produce fatal results.

Samples of cornstalks from various fields were analyzed, and potassium nitrate was found in such material in all of the 14 samples examined. These analyses were made in 1901. In 1902, however, an analysis of cornstalks received from fields where stock had died failed to show more than mere traces. It was concluded, therefore, that the disease was not due to vegetable alkaloids, and that the cause can not be determined without further investigation.

Report on an enzootic among cattle caused by a bacillus of the entiritidis group, J. R. Mohler and J. S. Buckley (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 297–331, pls. 5*).—A peculiar, highly infectious disease appeared among cows on a dairy farm near Washington, D. C. A motile micro-organism was obtained from the infected animals and cultivated on various nutrient media. The sanitary conditions of the stable were satisfactory except for the fact that the manure was allowed to accumulate in the basement to a great extent.

The symptoms of the disease were excessive salivation, drooping of the ears, purulent lachrymal discharges, occasional convulsions, and a temperature of 102.7 to 104.1°. Affected animals died within from 48 hours to 5 days. Petechial hemorrhages were found under the endocardium in all cases, the lungs were uniformly in a normal condition, while hemorrhagic extravasations were found in the small intestines. In 1 case which ran a chronic course the liver showed punctiform hemorrhages and areas of necrosis.

The bacillus isolated from these cases is aerobic or facultatively anaerobic, does not form spores, and is pathogenic for rats, guinea pigs, rabbits, pigeons, dogs, sheep,

hogs, and calves, but not for chickens. Notes are given on the behavior of the organism on various culture media. This organism was destroyed by exposure for 12 minutes to a temperature of 58° C. or for 3 minutes to a temperature of 70° C. Desiccation and exposure to diffuse light for a period of 3 days also produced sterility. The organism was killed by treatment for 30 seconds in a 1:10,000 solution of bichlorid of mercury, and growth was prevented by subjection to a 1:500 solution of permanganate of potash for 1 minute. Limewater in a 0.08 per cent solution killed the organism within 3½ hours.

A comparison was made between the organism isolated in this disease and the hog-cholera bacillus, in which it was found that the organism of the cattle disease was more virulent than the bacillus of hog cholera. It appears that a mutual agglutinative reaction exists between these 2 organisms. The literature of the subject is critically discussed in connection with a brief bibliography.

Hemoglobinuria of cattle in Germany, H. KOSSEL ET AL. (*Arb. K. Gesundheitsamte, 20 (1903), No. 1, pp. 1–77, pls. 3*).—Hemoglobinuria has long been recognized in cattle in Germany, and has been referred to under a large number of common names. The author made an extensive investigation of this subject, including a study of the symptoms, pathological anatomy, treatment, and prevention of the disease. It was found that as a rule the period of incubation was about 14 days.

A large number of inoculation experiments were made with the blood of diseased animals for the purpose of determining more accurately the symptoms and pathological lesions of the disease. Detailed notes are given on post-mortem examinations made on these cases. The blood parasite is identical with that found in Texas fever, and the disease may therefore be considered as Texas fever. It may be transferred to susceptible cattle by inoculation with virulent blood.

During the authors' experiments it was found possible to maintain the blood parasites outside the body in serum containing hemoglobin for a long period. In some instances the blood parasites were virulent after being preserved in this manner for a period of 42 days. Inoculation experiments with muscle serum showed that the blood parasites in animals affected with Texas fever remained alive only a short time in the muscles. The tick which is responsible for carrying hemoglobinuria in Germany from one animal to another is *Ixodes reduvius*. Detailed notes are given on this tick in its various stages. Experiments showed that it was possible to transmit the disease by placing infected ticks upon susceptible cattle. A large number of inoculation experiments have been made in order to determine practical methods of immunization against the disease.

As a result of the authors' investigations it is recommended that the material used in vaccination be obtained in a sterile condition, defibrinated, and preserved in an ice chest, and that it should be taken from animals only after 50 days following recovery from the disease. It is also recommended that preventive inoculation be made from 4 to 6 weeks before the animals are turned upon pasture and by the subcutaneous method in doses of 5 cc. The animals should then be kept in good hygienic conditions during the progress of the inoculation disease.

Diagnosis, prognosis, and treatment of actinomycosis, H. VALLÉE (*Rev. Gén. Méd. Vét., 1 (1903), No. 6, pp. 313–325, figs. 8*).—The author presents a detailed description of the organisms of actinomycosis and actinobacillosis. The symptoms of the disease are described with special reference to those which may serve for differential diagnosis. Notes are also given on the beneficial effects of treatment with iodid of potash.

The disinfection of the skins of animals affected with anthrax, J. LIGNIÈRES and J. ZABALA (*Rev. Gén. Méd. Vét., 1 (1903), No. 5, pp. 249–255*).—The antiseptic substances with which experiments were made included crude carbolic acid, lysol, coal-tar products, such as cresol, creolin, acaroin, etc. Notes are given on the conditions under which sporulation of the anthrax bacillus takes place. Solutions of crude

carbolic acid and 5 per cent solutions of the coal-tar derivatives were sufficient to destroy the anthrax bacillus but not the spores, when the skins were dipped in these solutions for a period of 15 minutes.

According to the observations of the author, sporulation does not take place under ordinary conditions within a period of 2 hours after removal from the animal. It is recommended therefore that the skins of animals affected or suspected of being affected with anthrax be dipped in an antiseptic solution immediately after being removed. This treatment will destroy all of the bacilli present and will thus effectively prevent the formation of spores.

Anthrax regulations (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 2, pp. 85–87*).—A copy is given of regulations concerning the importation of stock, feed, bones, bone dust, and other material, and the quarantine regulations regarding disinfection of suspected or infected material for the purpose of preventing the introduction and spread of anthrax.

Garotilha, E. MARCHOUX and A. SALIMBENI (*Ann. Inst. Pasteur, 17 (1903), No. 8, pp. 564–568*).—A fatal disease known under this name has long prevailed among cattle in Brazil. The disease is most destructive in herds of cattle which have been shipped from various parts of the country and are held temporarily in yards or pasture grounds near abattoirs. The disease was investigated by the authors, with the result that the anthrax bacillus was found in all cases. It was therefore concluded that this is nothing more nor less than anthrax. Under the conditions which prevail in Brazil it is believed that vultures play the most important rôle in distributing infection.

Some puzzling cases in cattle, possibly epizootic cerebro-spinal meningitis, J. N. GOULD (*Amer. Vet. Rev., 27 (1903), No. 6, pp. 512–514*).—A description of a number of cases of disease which occurred in parts of Minnesota and Iowa. Cattle were affected with a dullness, difficulty in locomotion, and later with cerebral disturbances. A large percentage of cases terminated fatally. The author believes that the trouble may have been due to the presence of ergot in the feed. Treatment with belladonna and magnesium sulphate gave good results.

Bursal enlargements upon the carpus of cattle and their treatment, A. ZEHL (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 5, pp. 445–475, pl. 1, fig. 1*).—The literature of this subject is critically discussed in connection with a bibliography of 81 titles. The author secured a large amount of material and investigated the growth and microscopical anatomy of the affected parts. Notes are given on the symptoms, differential diagnosis, prognosis, and treatment of this disease. The best results were obtained from the application of thorough drainage to the bursal enlargement and irrigation with antiseptic solutions.

The formation of callosities, chronic catarrh, and traumatic constriction of the teats of the bovine udder, E. KUHN (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 6, pp. 626–645, figs. 8*).—Detailed notes are given on the gross and microscopic anatomy, situation, and cause of callosities in the teats of cows. The symptoms and treatment of chronic catarrh of these structures is also discussed, together with notes on constriction of the lumen as the result of various injuries.

White scour in calves (*Norsk Vet. Tidsskr., 15 (1903), No. 3, pp. 92–97*).—Notes on the symptoms, etiology, and treatment of this disease. Antiseptic applications to the navel are recommended for controlling the disease. For this purpose a 2 per cent solution of lysol or a mixture of iodin and potassium iodid may be used.

Splenic leukemia in a calf five weeks old, D. A. DE JONG (*Arch. Path. Anat. u. Physiol. [Virchow], 173 (1903), No. 3, pp. 511–519*).—Notes are given on the symptoms and pathological anatomy of this disease, with special reference to a case recently observed by the author. In this case the carcass was rather fat, but showed a pronounced degree of icterus in the muscle and connective tissue. The spleen was much enlarged.

The number of red and white blood corpuscles was 400,000 and 30,000 per cubic millimeter, respectively. The number of leucocytes in proportion to that of the red blood corpuscles was therefore far greater than normal, and this proportion was chiefly due to the multiplication of large uninuclear leucocytes. The chromocytes were for the most part much smaller than under normal conditions. A critical examination in this case led the author to believe that it was of congenital origin.

The work against sheep scab in 1902, E. B. JONES (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 33–44*).—The effectiveness of dipping experiments in 1902 was greater than that obtained during the previous year. In 1902, 15,327,766 sheep were inspected, 1,840,308 dipped once, and 275,921 given a second dipping.

The number of scabby sheep received at stock yards where regular inspection stations are located was considerably decreased. The effectiveness of dipping was 92 per cent, as compared with 91.8 per cent of the previous year. Many more sheep were dipped by the owners the second time than during the previous year. Of the total number inspected, 1,366,007 were reported as infected. This number amounts to 8.9 per cent of the whole number. Detailed statistics are presented in a tabular form showing the number of sheep received at various stations and the results of dipping.

A comparison of the 3 dips used in 1902 showed the effectiveness of tobacco extract and sulphur to be 100 per cent, of lime and sulphur 89 per cent, and of nicotin and sulphur 21.3 per cent. At Kansas City nicotin and sulphur showed an effectiveness of 100 per cent, and lime and sulphur 99 per cent. The great effectiveness of these remedies from a single application is sufficiently indicated by these data. The author believes, however, that too much confidence should not be placed in a single dipping; a few scab mites may escape, and sheep are also subjected to subsequent infection.

Serum therapy for sheep pox, H. MARTEL (*Rev. Gén. Méd. Vét., 1 (1903), No. 11, pp. 609–617*).—The literature of this subject is briefly reviewed and statistics are given showing the success which has been had from vaccination for sheep pox. The results obtained are encouraging. It has been found that 10 cc. of the serum for adults and 5 cc. for young lambs is sufficient to produce quite substantial immunity, while encouraging curative properties were manifested when the serum was used in doses of 40 cc.

Epizootic abortion in mares, J. GUILLEREY (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1–2, pp. 37–68, figs. 4*).—The literature of this subject is critically discussed in connection with a brief bibliography. Detailed notes are given on a number of cases observed by the author and statistics are presented showing the period of incubation, age of the mother, age of the fetus, and complications which followed the act of abortion.

As a rule the period of incubation ranged from 10 to 18 days, and in certain cases the disease assumed a very acute form. In some cases the spread of the disease was exceedingly rapid, and in others quite slow. The most usual complications following abortion were retention of the afterbirth, metritis, infectious arthritis, hemoglobinuria, laminitis, and inflammation of the udder. In the prophylaxis of this disease the author recommends isolation of affected animals, thorough disinfection of the premises where the disease has prevailed, and destruction of the fetus. In treating the disease the author considers antiseptic applications in the uterus and vagina to be indispensable, especially in cases complicated with metritis.

Voges's description of mal de caderas, C. W. STILES (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 411–416*).—A brief summary of Voges's account of this disease, as presented in an article already noted (E. S. R., 14, p. 400).

Hyphomycosis destruens equi, J. DE HAAN and L. J. HOOGKAMER (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 3–4, pp. 395–410, figs. 5*).—A number of cases of this disease was observed by the authors. The chief symptoms are swelling and redness

of the gums in affected horses. The treatment tested by the authors consisted in removing the diseased tissue, painting the wounded part with iodin, and the administration of potassium iodid internally. This treatment appeared at first to give encouraging results, but later the pathological symptoms recurred in a more acute form.

The authors conclude as a result of the study that the disease appears most frequently on the skin and mucous membranes, especially on the lips and in the mouth and nasal cavities. In treating the disease it is recommended that affected tissue should be completely removed as soon as a diagnosis is possible. Microscopic examination of diseased tissue revealed the fact that mycelia of a fungus nature were present in the affected tissue. These pathogenic fungus mycelia were accompanied with spores, and are believed to be the cause of the disease. Brief notes are given by way of comparison of this disease with bursattee.

A larval form of Oxyuris equi, A. RAILLIET and A. HENRY (*Arch. Parasit., 7 (1903), No. 1, pp. 133–137, figs. 4*).—A detailed description is given of a larval form of this worm found in the esophagus and other portions of the alimentary tract of horses.

A parasitic Anguillula of the horse, JERKE (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 1–2, pp. 113–127, pl. 1*).—Notes are given on *Oxyuris curvula*, *O. mastigodes*, and *O. vivipara*. In the author's opinion the last-named species should be referred to the genus Anguillula. Detailed notes are given on the gross and microscopic anatomy of this species and on its economic importance. The author believes that the pathogenic action of this worm is very slight.

Ascaris megalocephala, SCHIMMELPFENNIG (*Arch. Wiss. u. Prakt. Thierh., 29 (1903), No. 3–4, pp. 332–376*).—A study was made of the chemistry of fluids found in the body of this worm, of the physiological action of these fluids, the chemical composition of the body of the worm, and the toxic effect of the presence of these worms. During these investigations it was found that there is a diastatic enzym in *A. megalocephala* with an action similar to the pancreatic juice, and also a number of proteolytic enzyms especially active in alkaline solutions.

Notes are given on the anatomy of the male and female worms of these species. As a result of infestation by these worms it is believed that sufficient nutriment may be removed from the alimentary tract to produce emaciation and anemia. Analyses of the worm showed the presence of 1.3 to 2.1 per cent glycogen.

A new filarial parasite of the blood, J. CAROUGEAU and G. MAROTEL (*Rev. Gén. Méd. Vét., 1 (1903), No. 8, pp. 447–454, figs. 6*).—A new species of Filaria, for which the name *F. blini* is proposed, was discovered in the aorta of the Asiatic buffalo (*Buffelus indicus*). The parasite is partly embedded in the tubercle produced by its presence on the inside of the aorta. The remainder of the parasite hangs free in the circulating blood. This parasite has thus far not been found in cattle.

The tapeworms of the dog and cœnurus of sheep, E. THIERRY (*Jour. Agr. Prat., n. ser., 6 (1903), No. 39, pp. 418, 419*).—A list is presented of tapeworms which infest the dog and notes are given on the life history and other hosts of these species.

Studies on so-called crude carbolic acid with special reference to its use in disinfecting cattle cars, C. FISCHER and F. KOSKE (*Arb. K. Gesundheitsamte, 19 (1903), No. 3, pp. 577–671, figs. 2*).—Experiments in disinfecting cattle cars, especially in destroying bacteria commonly found in such cars, were made with crude carbolic acid of 3 strengths, 25 to 30 per cent, 50 to 60 per cent, and 95 to 100 per cent. The latter form is also known as crude cresol. The experiments also included tests with commercial carbolic acid imported from England, and various mixtures of cresol with sulphuric acid, etc., as well as with Sanatol, Bacillol, Cresolin, Cresapolin, etc.

During these investigations it was found that the ordinary commercial preparations of crude cresol vary considerably in chemical composition, and that the disinfectant action of these preparations is therefore not uniform. Standard cresol only should

be used in the preparation of cresol mixtures and cresol solutions. In gross disinfection of cattle cars it was found that, as a substitute for the prescribed use of a 5 per cent solution of crude carbolic acid, good results were obtained from the use of a 3 per cent aqueous solution of crude cresol and crude sulphuric acid combined in the proportion of 2:1. This solution is easily soluble in water and exercises a pronounced disinfectant action.

A $2\frac{1}{2}$ per cent mixture of crude cresol and sulphuric acid destroyed glanders bacilli within 1 to $1\frac{1}{2}$ minutes, hog cholera bacilli within from 1 to 2 minutes, and *Staphylococcus pyogenes aureus* in from 2 to 3 minutes. The disinfectant power of the other substances mentioned above, all of which were used in a 5 per cent solution, stood in the following order of effectiveness: Crude carbolic acid, Sanatol, Bacillol, Cresolin, and Cresapolin.

The quarantine station at Athenia (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 293-296, pls. 6*).—A general description of the buildings, grounds, and capacity of the quarantine station of the Bureau of Animal Industry at Athenia, N. J.

AGRICULTURAL ENGINEERING.

Report of irrigation investigations for 1902, E. MEAD ET AL. (*U. S. Dept. Agr., Office of Experiment Stations Bul. 133, pp. 266, pls. 12, figs. 16*).—Investigations during 1902 similar to those of previous years (E. S. R., 14, p. 713) are here reported in part. The bulletin contains reports of special agents and observers as follows:

Irrigation in Mountain Water District, Salt Lake County, Utah, by E. R. Morgan; The Use of Water from the Wood Rivers, Idaho, by J. D. Stannard; Irrigation Investigations on Sand Creek, Albany County, Wyo., by B. P. Fleming; Irrigation in Washington, by O. L. Waller; Irrigation Investigations in Montana, 1902, by S. Fortier; Irrigation Systems on Stony Creek, Cal., by W. T. Clarke and C. W. Landis; Irrigation in the Black Hills, S. Dak., by A. B. Crane; Rice Irrigation in Louisiana and Texas, by F. Bond; Third Progress Report on Silt Measurements, by J. C. Nagle; Irrigation Experiments at the Missouri Experiment Station, by H. J. Waters; Irrigation in Wisconsin in 1902, by A. R. Whitson; Irrigation Investigations in New Jersey, 1902, by E. B. Voorhees; and The Use of Pumps for Irrigation in Hawaii, by J. G. Smith.

These reports deal primarily with duty of water in irrigation. That of Mr. Morgan on Jordan River and its tributaries shows the large losses from these streams and discusses means of saving the water now lost, among which is the running of the spring floods onto the lands along the upper reaches of the streams, thus storing the water in the soil. Mr. Stannard's report shows the large losses of water occurring on the Wood Rivers and discusses the advisability of using special structures to prevent these losses. Mr. Fleming's report deals with the use of the water of Sand Creek for the production of forage, and with the effect of the diversion of the water of the stream in Colorado on the supply to Wyoming users. The latter is of special importance because of its bearing on the use of other interstate streams.

Professor Waller's report calls attention especially to the damage being done by excessive irrigation in parts of Washington.

Professor Fortier's report gives a large number of measurements of the duty of water on special crops.

The report on irrigation systems of Stony Creek, Cal., shows especially the profit resulting from irrigation and diversification of crops as opposed to exclusive wheat growing without irrigation, and calls attention to what is being done by farmers in that region in storing storm water. Mr. Crane's report on irrigation in the Black Hills shows that storing storm water is profitable in that region also.

Mr. Bond's second report on irrigation of rice in Louisiana and Texas shows that the demand for water for rice-growing is in many cases outrunning the supply both from streams and from wells.

Professor Nagle reports as a general average of all of his measurements that the Brazos River carries "1.2 per cent of silt by volume at the end of one week's settlement and 0.9 per cent at the end of one year's settlement. He thinks the Brazos fairly represents the streams of the State of Texas."

Professor Waters reports a decided residual benefit to strawberries and asparagus at the Missouri Station from water applied the previous year. Observations at the Wisconsin Station on the residual effect of irrigation in the previous year show that irrigation may result in a decrease in yield the second year if the soil is not manured.

Professor Voorhees' report for 1902 is a study of methods of distributing and applying water. He found that open ditches lost large percentages of the water turned into them. Tarred canvas used as a ditch lining proved very effective and not expensive. Clay thrown in the water and puddled did not do so well. Professor Voorhees also gives the records of wells in several sections of New Jersey, in order to show the possibilities of this source of water supply.

Mr. Smith's report on pumping water in the Hawaiian Islands gives valuable data on the efficiency and cost of operation of various kinds of pumps.

Plans of structures in use on irrigation canals in the United States (*U. S. Dept. Agr., Office of Experiment Stations Bul. 131, pp. 51, pls. 22*).—This is an album of 22 plans of irrigation structures designed by leading irrigation engineers of the United States. The plates were made from drawings exhibited at the Paris Exposition in 1900 and the Buffalo Exposition in 1901.

Storage of water on Cache la Poudre and Big Thompson rivers, C. E. TAIT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 134, pp. 100, pls. 5, figs. 10*).—This bulletin gives details of areas, capacities, and construction of reservoirs in northern Colorado, in the watersheds of the Cache la Poudre and Big Thompson rivers, and the profits from their use.

Storage reservoirs on Stony Creek, California, B. COLE (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 86, pp. 62, pls. 16, figs. 38*).—"The paper treats of the possibilities of reclaiming by irrigation large areas of land in the valley of Stony Creek, a tributary of the Sacramento River, and on the west side of the Sacramento Valley, which have been cultivated by dry farming, but on which irrigation may apparently be introduced with much advantage."

From the investigations reported the conclusion is drawn that "several commercially valuable reservoir sites exist in the water shed of Stony Creek and its tributaries. The annual run-off is sufficient to fill these reservoirs in years of average rainfall. In the case of the Mill Site reservoir the supply is many times greater than the capacity of the reservoir. There would probably not be sufficient run-off to fill the Briscoe Creek and Little Stony Creek reservoirs in years of very low rainfall. . . . The conditions are favorable for long life of the reservoirs on account of the small amount of silt and débris carried by the streams."

Report of progress of stream measurements for the calendar year 1902, F. H. NEWELL (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 82, pp. 199; 83, pp. 304, figs. 7; 84, pp. 200, figs. 2; 85, pp. 250, figs. 2*).—These 4 papers give the results of hydrographic measurements made during the year 1902, the first 2 covering the territory east of the Mississippi and the last 2 that west of the Mississippi. "These papers contain, for the various gauging stations, the original data as collected, and the results obtained from the discussion of these data, also such other information as is of interest in hydrographic studies."

The agricultural importance of collecting and utilizing the waters of mountain areas, F. W. TOUSSAINT (*Fühling's Landw. Ztg., 52 (1903), No. 19, pp. 689–695*).—A general discussion of this subject.

Drainage and the agricultural sanitation of soils, L. FAURE (*Drainage et assainissement agricole des terres. Paris: Ch. Béranger, 1903, pp. XIV + 279, figs. 120, dgms. 4*).—Under the head of drainage the removal of water by means of tile drains

is considered, and under agricultural sanitation the use of open and covered ditches for this purpose. Principles and practical methods are given full treatment, especially in their engineering aspects.

Drought, drainage, and subirrigation, W. CLATWORTHY (*Queensland Agr. Jour., 13 (1903), No. 2, pp. 133–137*).—A brief account of experiments in which there was used "for the purpose of subirrigation and drainage combined a 2-in. percolating, porous pipe made in 18-in. lengths, which served admirably the double purpose of irrigation and drainage for small areas. . . . The number of pipes per acre, laid 15 ft. apart, was about 2,000, the cost of which was 10s. per 100 ft. at the factory, making the total cost for pipes alone £15 ($75) per acre."

The value of water power, L. KOCH (*Fühling's Landw. Ztg., 52 (1903), No. 19, pp. 712–715*).—A brief discussion of the relative cost of steam and water power.

Roller gins for cotton, F. MAIN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 40, pp. 443–447, figs. 5*).—Several improved roller gins are described.

Time and cost of making earthworks, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 40, pp. 447–450*).—Simple methods of making estimates of these factors based on an examination of the character of the soil.

On the reduction of nitrates by sewage, LETTS, R. F. BLAKE, and J. S. TOTTON (*Chem. News, 88 (1903), No. 2289, pp. 182, 183*).—A brief account is given of a study of this subject with reference to the bacterial purification of sewage.

The misuse of physics by biologists and engineers, W. S. FRANKLIN (*Science, n. ser., 18 (1903), No. 464, pp. 641–657, figs. 2*).—In this paper the author argues that there is a sharp line of demarcation "between systematic physics and what we may call statistical physics . . . suggesting in a general way the error of the indiscriminate application of the philosophy of the exact sciences in the study of natural phenomena." The author's position in brief is "that the idea of quantitative relationships and the idea of one-to-one correspondence in general, as these ideas are known in physics, are inapplicable and necessarily fruitless in such fields as physical psychology and meteorology."

MISCELLANEOUS.

Twenty-sixth Annual Report of Connecticut State Station, 1902 (*Connecticut State Sta. Rpt. 1902, pp. XV*).—These pages accompany part 4 of the report and contain the organization list of the station, an announcement concerning the work of the station, a brief report of the board of control, and a financial statement for the year ended September 30, 1902.

Sixteenth Annual Report of Nebraska Station, 1902 (*Nebraska Sta. Rpt. 1902, pp. 129*).—This includes the organization list of the station, a review of station work during the year, a financial statement for the fiscal year ended June 30, 1902, and 3 articles abstracted elsewhere.

Annual report for the year 1902 of the Agricultural Experiment Station of Ploti (*Rap. An. Sta. Expt. Agron. Ploty, 8 (1902), pp. XXII + 151, pls. 2, figs. 2, charts 5*).—Detailed reports in the Russian language, with summaries in French, covering the work of the station during the year on meteorology (see p. 454), in the chemical laboratory (see p. 456), and in the experimental field and vineyard (see p. 463). The work during 1902 was mainly a continuation of that of previous years (E. S. R., 14, p. 340).

Nineteenth Annual Report of the Bureau of Animal Industry, 1902 (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1902, pp. 651*).—This includes a report of the chief of the Bureau reviewing the different lines of work during the year, 15 articles noted elsewhere in this issue, and 6 articles already noted from other sources as follows: Scabies in cattle (E. S. R., 14, p. 191); feeding native steers (E. S. R., 14, p. 598); the relation of protein in cotton-seed meal, cowpea hay, and wheat bran

(E. S. R., 14, p. 605); the water content of creamery butter (E. S. R., 14, p. 1115); the physiology of milk secretion (E. S. R., 13, p. 884; 14, p. 608); and takosis, a contagious disease of goats (E. S. R., 15, p. 304).

Statistics are given on the value of animals sold and slaughtered on farms in 1899, imports and exports of animals and animal products, receipts and shipments of live stock during 1902, and on the wool product of the United States in 1902. Some agricultural experiment station work is reviewed, a list is given of State sanitary officers having charge of live stock matters, and the rules and regulations of the Bureau of Animal Industry issued in 1902 are included.

Brief articles based largely upon consular reports are included on the following subjects: Death of cattle supposed to be due to *Strongylus micrurus;* demand for American horses in France; horse breeding in Germany and France; importation of cattle into Cuba; meat and cattle trade in Barcelona; German meat inspection; fees for inspecting meat in Germany; meat inspection expenses in Germany; the price of pork in Germany; meat imports into England; price of beef and scarcity of cattle in Belgium; meat and dairy products in New Zealand; slaughtering of cattle for jerked beef in River Plate districts, 1899 to 1902; exports of animal products from the Transvaal; sausages in Spain; jerked beef exports to Cuba; frozen meats and statistics of live stock in Uruguay; meat, butter, and eggs in Russia; Russia's export of poultry; numbers of live stock in United Kingdom; loss of live stock in Australia; live stock statistics of France; exports of animals and animal products from Argentina; wool production in Australasia; Australian wool for the United States; wool trade in Australia; imports of Angora goatskins; imports of mohair at Bradford, 1897–1902; salt for sheep; cattle food from sugar cane in the West Indies; milk powder in Sweden; Persian lamb, Gray Crimmer, and Astrakhan; and the musk ox.

Reprints from Bulletins Nos. 47, 50, and 52, and Annual Reports 8 to 11 (*Oklahoma Sta. Bul. 59, pp. 200*).—The articles reprinted are as follows: Reports of wheat raisers (E. S. R., 12, p. 850); experiments with wheat, 1900 (E. S. R., 12, p. 846); manuring the soil (E. S. R., 13, p. 235); the potato crop (E. S. R., 13, p. 845); variety tests of cabbage (E. S. R., 13, p. 853); feeding experiments, 1896–1899 (E. S. R., 11, p. 1069); wheat culture experiments, 1898–99 (E. S. R., 11, p. 1036); destruction of insects (E. S. R., 11, p. 1067); disease among horses (E. S. R., 11, p. 1090); summary of results of experiments with field and orchard crops (E. S. R., 11, p. 1036); means of preventing Texas fever (E. S. R., 12, p. 691); hog cholera (E. S. R., 12, p. 692); diversified farming in Oklahoma (E. S. R., 12, p. 640); summary of press bulletins (E. S. R., 12, p. 697; 13, p. 598; 14, p. 406); wines and wine making (E. S. R., 12, p. 693); grape growing (E. S. R., 12, p. 648); fungus diseases of grapes (E. S. R., 12, p. 657); insects affecting the grape (E. S. R., 12, p. 664); insecticides and fungicides (E. S. R., 12, p. 664); stock feeding (E. S. R., 12, p. 677); some Oklahoma feeding stuffs (E. S. R., 12, p. 677); cotton-seed meal as pig feed (E. S. R., 13, p. 583); cowpea hay for swine (E. S. R., 13, p. 584); the orchard (E. S. R., 13, p. 553). Several of the above articles have been abridged. The bulletin is intended to furnish information frequently asked for by new settlers in the Territory, and as no new matter has been included in the bulletin it will not be sent to the regular mailing list.

Bulletins and annual reports of Arizona Station, W. O. HAYES (*Arizona Sta. Index to Vol. III, Buls. 33–40, and Ann. Rpts. 1900–1901, pp. 339–365*).—A general index.

Legislation relating to farmers' institutes in the United States and the Province of Ontario, Canada, J. HAMILTON (*U. S. Dept. Agr., Office of Experiment Stations Bul. 135, pp. 53*).

A few good books and bulletins on nature study, school gardening, and elementary agriculture for common schools, D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Circ. 52, pp. 4*).

History of German agriculture, T. von der Goltz (*Geschichte der Deutschen Landwirtschaft. Stuttgart and Berlin: J. G. Cotta, 1903, vol. 2, pp. VI+420*).—The first volume of this work has been noted (E. S. R., 14, p. 718). This second volume, which completes the work, treats of German agriculture in the nineteenth century. Agricultural reform in the first half of the century, the agricultural development along scientific lines since 1850, and the causes and character of the recent agricultural crisis in Germany are discussed.

Agricultural education in Germany (*Jour. Bd. Agr. [London], 10 (1903), No. 2, pp. 184–193*).—An outline of the scope of the agricultural educational work carried on in Germany. Courses of studies are given in some instances, with the number of hours devoted to each. One of the special features of German agricultural education is the advanced lecture course for owners, managers, agents, and farmers, which has recently been introduced at a number of the colleges and universities. This course is held for 1 week in winter. The year's progress in agriculture and natural science, jurisprudence, political economy, and all other subjects which may be of interest and importance to owners, managers, and farmers is summarized by 20 or 30 university and Government lecturers.

Agricultural returns for Great Britain, 1903 (*London: Bd. Agr., 1903, pp. VI+53*).—Tables showing the acreage under crops and grasses and the number of horses, cattle, sheep, and swine in each county of Great Britain, with summaries for the United Kingdom.

NOTES.

Alabama Station.—C. M. Floyd has been appointed farm superintendent, vice T. U. Culver, who has resigned to engage in farming. A small herd of Herefords and additions to the Shorthorn and Angus herds have recently been purchased. Feeding experiments with four lots of grade Shorthorn steers are in progress. The veterinarian has inoculated several carloads of thoroughbred Hereford cattle as a protection against Texas fever. These will be sold at auction in February.

Connecticut State Station.—Max Silverman, assistant chemist, resigned his position December 1, 1903.

Connecticut College and Storrs Station.—Dr. B. F. Koons, for many years president of the Storrs Agricultural School and later of the college which grew out of this school, died December 17 at the age of 55 years. The cause of his death was cancer of the throat. At the time of his death Dr. Koons was consulting entomologist to the Storrs Station and professor of natural history in the college. He had been connected with the institution for over 20 years. The station has arranged for cooperation with the Dairy Division of this Department in investigating the principles involved in the manufacture of varieties of soft cheese similar to those common in western Europe. An expert in the manufacture of soft cheeses has been engaged for this work and curing rooms will be erected.

Georgia Station.—D. A. Duffee has become foreman of the horticultural department of the station.

University of Illinois.—Press reports state that the appropriation act of the State legislature for the University of Illinois includes an item of $100,000 for extension of the engineering department. It is planned to start a State engineering experiment station, where advanced work in engineering may be carried on. The "station" will provide not only for undergraduate instruction, but for the working out of new problems in engineering which are of importance to the construction and transportation industries of the State.

Iowa Station.—W. W. Smith has been elected assistant in animal husbandry.

Kentucky Station.—G. N. Keller has been appointed assistant entomologist and botanist.

Cornell University.—A journal to be known as the *Cornell Countryman* has recently been started by the students of the college of agriculture.

South Carolina Station.—Two small flocks of Shropshire and Southdown sheep have been added to the stock of the station.

South Dakota College and Station.—The new $12,000 barn provided for by the last legislature is nearly completed. This barn has been made of sufficient size to amply accommodate the stock of the college farm and experiment station for several years to come. One-third of the space, or 40 by 60, is to be used for animal feeding experiments, and a similar space is to be used for classes in live-stock judging and farm mechanics. The barn is a frame building with cement floor, and has a complete set of drains which empty into a large cistern. Experiments will be conducted in the future on the value of liquid manure as compared to other manure. The college now has representatives of 17 different breeds of live stock and intends to add several more the coming year.

West Virginia University.—Extensive preparation has been made for the winter school for farmers, which will include a course of 100 lectures on various phases of agriculture during January and the early part of February. The course will last 4 weeks, with 5 lectures each day on such subjects as dairying, poultry industry, horticulture, veterinary science, animal breeding and feeding, plant diseases, economic relations of farming, chemistry of soils and fertilizers, agriculture and geology, agricultural physics, rural water supply, rural schools, farming as a business, etc. Arrangements were made for the meetings of the State Grange, the State Live Stock Association, and the Conference of Farmers' Institute Instructors to be held during the winter school, and also a meeting for the purpose of organizing a State Dairymen's Association. The regents of the university have established a department of dairying in the school of agriculture, and a dairy herd and modern apparatus for home dairying and for a working laboratory in this department have been provided. It is stated that at present there is not a creamery in the State, only one cheese factory, and comparatively few up-to-date, well-managed dairies.

Wisconsin College and Station.—During the week ended December 12 the Wisconsin farmers' institute field workers were in attendance at the agricultural college and experiment station, receiving instruction to better aid them in the conduct of their meetings among the farmers of the State. About 25 workers registered for the week's instruction. The benefits of bringing the institute workers into such close connection with college and station will be apparent to all. The college announces a two weeks' farmers' course to begin February 5. Only persons 25 years of age or over will be admitted to the course. No fees are charged residents of the State. Half a dozen agricultural experts from other States will assist the instructors in making this course intensely practical and helpful to the busy farmer. Special attention will be given to corn judging and to stock judging. A number of animals will be slaughtered for a study of carcasses and various parts of the same. Attendance at the college of agriculture the present year is as follows: Graduate students, 3; four-year course students, 57; short course students (two winter terms of 14 weeks each), 308; dairy students (12 weeks' course, 5 months' previous experience in creamery or cheese factory required), 148.

Wyoming University and Station.—Henry G. Knight, of the State University at Seattle, Wash., has accepted the position of chemist in the university and station recently vacated by E. E. Slosson, who has been granted leave of absence for 8 months, but whose return to the university is uncertain. Some changes are being made in the requisition system of the station which will make the director more definitely responsible for the station expenditures; and the station work is being reorganized so as to separate it more definitely from the university and relieve the station workers from teaching duties as rapidly as this can be brought about.

Bills before Congress.—The following bills and resolutions have been introduced in Congress relative to the publications of this Department: A joint resolution providing for the publication of 200,000 copies of the Special Report on the Diseases of Cattle, prepared by the Bureau of Animal Industry; a resolution looking to the reprinting in one volume, and with such revision as may be needed to bring the same up to date, of numerous publications issued by the Bureau of Animal Industry on hog cholera and swine plague; a joint resolution providing for the printing of an additional 42,000 copies of the Yearbook of this Department for the purpose of supplying the same to the students of the various agricultural colleges; a joint resolution directing the publication of 8,500 copies of the set of food charts prepared by this Office several years ago; and a bill increasing the edition of the Yearbook (now 500,000) to 1,000,000 copies and the Department's quota to 60,000 copies, and increasing the edition of the report of the Bureau of Animal Industry (at present 30,000) to 150,000 copies.

Hon. H. C. Adams, of Wisconsin, a member of the Committee on Agriculture of the National House of Representatives, introduced a bill in that body January 4 to provide for an increased annual appropriation for agricultural experiment stations. The initial increase named is $5,000, with an additional $2,000 a year until a total of $15,000 is reached. These funds are "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States."

The emergency appropriation made last year to eradicate the foot-and-mouth disease has been amended so as to make $250,000 of the appropriation immediately available "to meet the emergency caused by the ravages of the Mexican cotton-boll weevil and other insects and diseases affecting cotton."

A bill extending the franking privilege to the State and Territorial departments of agriculture in mailing "documents relating to agriculture to the farmers within the borders of their respective States or Territories."

Meeting of Horticultural Inspectors.—The Association of Official Horticultural Inspectors met in Washington November 17 and 18. No formal papers were presented, the time being occupied with a discussion of the topics which had been suggested by the vice-chairman, J. B. Smith, in the announcement of the meeting.

The question as to what provisions in inspection laws are likely to prove unconstitutional if tested was thoroughly discussed. It developed during this discussion that nurserymen's associations and various horticultural inspectors had submitted the inspection laws of different States to competent attorneys for opinions on their constitutionality. The unanimous opinion of attorneys on these points indicated clearly that no inspection law is constitutional which contains requirements discriminating against nurserymen living outside the State, for the reason that it is an interference with interstate commerce. It appears, therefore, to be illegal to require the fumigation or other treatment of nursery stock before it is admitted into a State, although it is legal to require its fumigation after it has been introduced and before it is distributed. A resolution was adopted to the effect that no State law should discriminate against nurserymen of other States, and that fumigation or other treatment should not be required before the introduction of stock from outside States, but only after its introduction, and then only in case similar treatment is required of local nurserymen.

Discussing the attitude of nurserymen's associations toward inspection laws, G. G. Atwood suggested that an attempt be made in all States at cooperation between inspectors and nurserymen in the enforcement of inspection laws. As long as nurserymen and inspectors are at odds harm results to both parties. More drastic measures are taken by inspectors, with the result that more stock is eradicated or destroyed, and the nurserymen suffer loss; while the active opposition of nurserymen brings about a loss of respect for the opinions of inspectors. In Georgia and Maryland the sentiment of nurserymen was said to be in favor of inspection, while in New York, according to G. G. Atwood, decided objections have been raised against inspection before the introduction of nursery stock, but at present the nurserymen are inclined to abide by the inspection laws. In Ohio complaint was made that there is too much formality and delay in the operation of the inspection law; otherwise, nurserymen are favorably disposed toward the inspection laws. In New Jersey J. B. Smith found conditions under which he believed that nurserymen should be allowed to sell stock, whether it is infested or not, to men who are willing to buy the stock with the full knowledge of its condition. Similar experience had also been had in Georgia.

As the result of this discussion, the association adopted a resolution to the effect that inspectors should attend to the technical scientific matters concerned in all cases, and should not be required to take any part in civil or criminal proceedings resulting from violation of inspection laws.

Concerning the protection to which a nurseryman is entitled against scale-infested surroundings, it appeared that in many States the premises of nurserymen were located in the midst of badly infested surroundings, in some instances with infested orchards within a distance of a half mile. Under such circumstances infestation might readily be spread from such orchards to nursery stock. On this account nurserymen in various States have complained that it was unfair to them to allow infested orchards to stand, while the nurserymen were required to destroy infested stock. C. V. Piper stated that in the State of Washington the general sentiment of orchardists and nurserymen was that inspection was absolutely unnecessary, and a burden upon both nurserymen and orchardists, since remedies had been found by which the scale can be controlled, and infestation is so general that orchardists could not hope to secure stock perfectly free from it.

In the discussion of this question some attention was given to the distribution of the San José scale on forest trees and shrubs other than fruit trees. In the Eastern States the scale has not been found on forest trees except in the immediate vicinity of orchards, while in Washington it has been found in forests at least one-half mile from any orchard.

Regarding the selling of nursery stock exposed to infestation which has subsequently been fumigated, it was shown that fumigation is often imperfectly done, or the chemicals are impure or are not properly mixed, with the result that fumigation is not satisfactory. A discussion of potassium cyanid sold in drug stores brought out the fact that in using it for destroying granary insects it has frequently been found of inferior quality, and cases were cited in which the purity of the drug varied from 28 to 98 per cent. It was stated, however, that in the future almost the total output of potassium cyanid would be of 98 per cent purity, which is the strength recommended as standard in fumigation work.

Where fumigation is properly performed, the consensus of opinion seemed to be that it is effective and reliable, especially in cases of comparatively slight infestation. In Maryland fumigation is regarded as rendering nursery stock free from infestation, and in Delaware it is assumed to be superior to a certificate of inspection, since inspection has sometimes failed to detect the presence of the scale. H. E. Summers stated that in Iowa San José scale does not exist in nurseries. J. B. Smith stated that in New Jersey infested nursery stock is allowed to be sold after fumigation, under a declaration of the fact that the trees have been infested. Fumigation is recommended, but all trees which are found infested even with dead scales after fumigation are destroyed. This procedure was considered by others to be inconsistent and was declared to weaken the case for fumigation.

In a resolution bearing upon the formula to be used in fumigation and the attitude of nurserymen's associations toward inspection laws, the association recommended the use of the 1:2:4 formula in fumigation, and expressed the opinion that it is possible to frame inspection laws so as to avoid trouble with nurserymen and at the same time to protect the interests of both the nurserymen and fruit growers. The cooperation of the nurserymen and inspectors was urged.

Some attention was given also to the question of treatment of infested orchards. W. E. Britton stated that in Connecticut excellent results had been obtained from a wash made of equal parts of sulphid of potash and lime diluted with water. Calcotheon gave poor results in New York, and E. P. Felt had also found that salt has no insecticidal value in the lime, salt, and sulphur mixture. The salt was therefore omitted in spraying experiments, and a mixture was made containing 25 lbs. of lime, 20 lbs. of sulphur, and 60 gal. of water. In various experiments the proportion of lime and sulphur varied considerably, and an attempt to determine the exact chemical composition of the mixture obtained was unsuccessful. Certain adhesive substances added to the lime and sulphur mixture were found to cause it to adhere to the tree for a longer period. Whale-oil soap at the rate of 1½ lbs. per gallon of

water was used by orchardists in New York with good results. Crude petroleum when applied for a series of years was found to increase the size of the lenticels and the thickness of the bark, and the trees were injured in other ways. In New Jersey the use of oil is now largely confined to pear trees, which are believed to receive a positive benefit from such treatment. On all other fruit trees the lime-sulphur mixture is used almost exclusively.

In Ohio A. F. Burgess found that salt could advantageously be left out of the mixture, but that it must be thoroughly boiled. The length of the boiling period varied from 30 minutes to 1 hour, according to the custom of inspectors in different States. J. B. Smith called attention to the desirability of devising some method by which the lime-sulphur mixture can be prepared without boiling, since the boiling process is considered by many horticulturists to be a troublesome operation. Several inspectors had noted the fungicidal value of the lime-sulphur mixture. This remedy is especially valuable in the treatment of leaf curl, and perhaps for certain other important fungus diseases.

In a discussion of the effect of cold weather upon San José scale, it was said to be unaffected by 30° F. below zero in New Jersey, while in Georgia 98 per cent were reported killed by a temperature of 4° below zero, and in Iowa the scale was unable to endure the winter, except in the extreme southern part of the State. Attention was called to the fact that frequently from 80 to 90 per cent of the scale die during the winter, under normal conditions.

The following officers were elected for the coming year: S. A. Forbes, chairman; J. B. Smith, vice-chairman; J. B. S. Norton, secretary.

International Live Stock Exposition, 1903.—This exposition, held in Chicago from November 28 to December 5, 1903, was generally conceded the most satisfactory which has been held, the exhibits of fat stock, breeding cattle, sheep, and hogs being very satisfactory, while those of horses were unusually fine. As in earlier years, the agricultural colleges and experiment stations were well represented, the parts which they took as exhibitors and in judging being briefly summarized below.

Prof. C. F. Curtiss, of the Iowa Station, one of the directors and a member of the executive committee of the association having the management of this show, acted as one of the judges, as did also E. A. Burnett, W. L. Carlyle, John A. Craig, W. A. Henry, W. J. Kennedy, W. J. Rutherford, and Thomas Shaw.

Special cash prizes for cattle, sheep, swine, and dressed animals, and feed and forage products were provided for the agricultural colleges and experiment stations, and there were entries from the Iowa College and Station, the Minnesota Station, the University of Nebraska, the Ohio State University, Purdue University, and the Wisconsin Station. Aside from the prizes taken in this special "college" class, a considerable number were taken by these institutions in the general classes open to all.

The grand prize in the fat-stock class of the show was won by Challenger, a two-year-old grade Hereford steer, selected from a feed lot and fattened by the University of Nebraska, which also took first prize in the college class. The second prize in this class went to Purdue University, the third to the University of Nebraska, the fourth to the Minnesota Station, and reserve to the Iowa College. The Minnesota Station took the first, second, third, and fourth prizes and reserve for yearling cattle; and for calves the first prize went to the Iowa College, the second to the Minnesota Station, and third, fourth, and reserve to the Iowa College. On the best 5 steers or spayed heifers under 3 years of age, the first prize was awarded to the Minnesota Station, and reserve to the Iowa College.

In the college sheep classes, open to all pure-breds and grades, the first and second prizes for yearling wethers were awarded to the Wisconsin Station, and the third to the Minnesota Station; wether lambs, first and second prizes to the Wisconsin Station, and third to the Iowa College; and the Wisconsin Station took prizes for the champion wether and the best 5 wethers under 2 years of age.

In the college exhibit of swine the first, second, and third prizes for yearling barrows, prize for champion barrow, and for the best 5 barrows under 2 years of age were all awarded to the Iowa College. The first prize for a general exhibit consisting of 5 head of cattle under 3 years of age, 5 sheep under 2 years, and 5 hogs under 1 year was awarded to the Minnesota Station, and the second to the Iowa Agricultural College.

In the dressed-carcass competition the first prize for yearling carcass and champion was awarded to the Iowa Station for a steer which had received the fifth prize in the live exhibit. The first and second prizes for dressed carcasses of yearling wethers were awarded to the Wisconsin Station, and the third prize to the same institution for the carcass of a lamb. In the case of hogs of the bacon type, weighing from 100 to 200 pounds, the first prize was awarded to the Iowa College for a Berkshire, this being the animal which had received the first prize before slaughtering, and the second prize was taken by the Minnesota Station.

The University of Nebraska had an exhibit of feeding stuffs, very well arranged to show the amount of materials required for balanced rations, and the composition and percentage of digestible nutrients. It was the only exhibitor in this class and was awarded a first prize.

A feature of the exposition was the students' judging contest for the Spoor Trophy, which was this year limited to teams from the Iowa, Kansas, Ohio, Minnesota, and South Dakota agricultural colleges. In this competition the Iowa College won the trophy and the Ohio University team was awarded second place, Minnesota third, and Kansas fourth. As regards the rank of the individual students competing, one of the Iowa team was given highest standing, with one of the Kansas team a close second; third place was awarded to one of the Iowa students and fourth to one of the Minnesota students.

Monday, November 30, was agricultural college students' day at the show, and delegations were present, among others, from Illinois, Iowa, Michigan, Minnesota, Nebraska, Ohio, South Dakota, and Texas, and throughout the exhibition the number of instructors and students present from various agricultural colleges and stations in the United States and Canada was noticeably large. It is safe to say that the colleges and stations have exercised a decided influence on the live-stock industry, and one which will be even more important in the future.

A fine oil portrait of C. F. Curtiss was presented to the Saddle and Sirloin Club, a local association of men interested commercially in the live-stock industry, by Prof. W. A. Henry on behalf of the alumni of the Iowa Agricultural College, the donors of the portrait.

New building at the Nova Scotia Agricultural College.—An agricultural college has been located on the Provincial Farm at Truro, N. S., and an agricultural building is nearing completion. It is an attractive stone and brick structure, with a frontage of 98 ft. by a depth of 55 ft., and contains a basement and two main floors. The building will cost about $30,000. The basement contains a blacksmith shop, a carpenter shop, students' laboratory, and storerooms. On the first floor are located a large chemical laboratory, a class room, offices, and cloakrooms, and a horticultural workroom, the latter communicating directly with the greenhouses in the rear of the building. The second floor contains an assembly room 52 by 60 ft., a class room, and rooms for students and instructors.

The courses of instruction at the college will be suited especially to the needs of farmers and farmers' sons. The institution will include departments of agriculture, horticulture, agricultural chemistry and physics, nature study, English and mathematics, and institute, demonstration, and research work. Short courses of about 2 weeks each held during the winter will be made a feature. In addition to a regular staff of instructors for the longer courses, specialists will be engaged to assist in the instruction. Short courses in animal industry and stock judging and in dairying

are to be given the present winter, beginning the latter part of January, in which several professors from the Ontario Agricultural College will assist.

The stock of the farm has recently been increased by the purchase of several high-grade Herefords. A new poultry house has been built during the past season, and 1,200 chicks were raised on the farm, 1,000 being fattened in crates. These were sold for 18 cts. a pound, or about $1.50 per pair.

Essex County Laboratories.—The new county buildings at Chelmsford, England, erected at a cost of about $60,000 by the Essex County Council, were formally opened recently by the Earl of Onslow, president of the Board of Agriculture. They are under the control of the Essex Education Committee, and comprise chemical, physical, and biological laboratories and class rooms, as well as agricultural and horticultural museums and libraries, and are designed to afford opportunities for systematic instruction in agriculture and horticulture, as well as in pure science.

Rooms are provided for the examination of soils, manures, seeds, etc., and for other scientific work in connection with agriculture and horticulture. There is also a large dairy in the basement for instruction in butter and cheese making and the treatment of milk. In connection with the dairy school a short course of one week's duration will be given in milking and the proper treatment of milk for market. There is a school garden a short distance from the buildings which contains 3 acres and is provided with a potting shed and hothouses.

In addition to the more purely agricultural and horticultural courses of lectures and practical work, classes are held in chemistry, physics, and biology, largely for the training of teachers. The County Council offers several scholarships and a number of the classes are free to selected candidates, who must be residents of Essex County. The influence which the improved facilities will exert on local agricultural and horticultural affairs was spoken of by Mr. E. N. Buxton, chairman of the Essex Education Committee, in an address delivered at the inaugural proceedings.

Normal Training Classes for Rural Teachers.—The ten county normal training classes provided for by the last legislature of Michigan have been located by the State Superintendent of Public Instruction in the following towns: Evart, Charlevoix, Cadillac, Standish, Kalkaska, Mancelona, Ithaca, Pontiac, Saint Johns, and Port Huron. One-year and two-year courses are provided, and in the course of study suggested by the Superintendent of Public Instruction elementary agriculture is required in both semesters of the one-year course and the first year of the two-year course, and is elective throughout the second year of the two-year course. Applicants for admission to either of the courses must subscribe to a declaration that it is their purpose to engage in teaching in the rural schools or in the lower grades of the graded schools in the State.

Girls' Industrial College.—According to a note in *Gardening*, the Girls' Industrial College of Texas, which was opened to students in September last, will make a special feature of horticulture and floriculture. Three new greenhouses 18 by 40 ft. have just been completed, and will be gradually stocked with an assortment of bedding and decorative plants. A small nursey has also been established, and a course of instruction in growing, grafting, budding, etc., will be afforded students who desire it. The campus of the institution embraces about 70 acres, a large part of which will be devoted to forestry and landscape gardening.

A New General Index.—A general index to the *Hygienische Rundschau*, Volumes I to X, 1891–1900, has just been issued by the editor, Dr. R. Thiele. It comprises author and subject indexes, an index to original contributions to the journal, and lists of books and of illustrations, and makes a volume of 432 pages. As the *Rundschau* is largely an abstract journal, and includes in its scope many subjects relating to agricultural science, this general index to its first ten volumes may often prove helpful to station workers in bacteriology, animal diseases, etc. A large number of

entries are given under foods, dairy products, meat, wine, water, bacteriology, hygiene, animal diseases, immunity, disinfectants, etc.

Miscellaneous.—Press reports state that Dr. C. W. Dabney has resigned as president of the University of Tennessee, to accept the presidency of the University of Cincinnati. The resignation is effective September 1 next. His acceptance is stated to be conditioned on an income of $250,000 per annum for the Cincinnati institution.

Since the retirement of Prof. W. H. Brewer no provision has been made for carrying on the course in agriculture at the Sheffield Scientific School, which was formerly in his charge, and the course has now been discontinued.

A note in *Science*, taken from the London *Times*, states that the late Charles Seale-Hayne, M. P., has, under his will, provided for the establishment of a College of Science, Art, and Agriculture in the neighborhood of Newton Abbot, open to students of the county of Devon. Details will be left to the executors. It is thought that about £150,000 will be handed over for the college.

The German Government has under consideration a project for the establishment of a von Behring Institute modeled after the Pasteur Institute in Paris. The principal objects of the new institute will be the promotion of research in serum therapy and the preparation of sera of various kinds.

The Board of Agriculture of Great Britain has made arrangements for the examination of apparatus used in the Lister-Gerber and other similar milk tests. This service is rendered by the National Physical Laboratory, which has adopted a scale of fees for test bottles, pipettes, and measuring glasses, only one-half the full fee being charged for apparatus which is found to be below the standard. Apparatus found to be accurately graduated is marked with the monogram of the laboratory.

At the recent Apple Congress held in St. Louis a resolution was adopted which favored the making of all apple barrels 17⅛ inches in diameter at the head, with staves 28½ inches in length, and the barrel to hold 3 bushels. Bushel boxes were recommended to be 11½ by 11½ by 20 inches on the inside. This makes a box containing 2,645 cubic inches, whereas the present box used for apples contains but 2,150 cubic inches, approximately the legal bushel.

The revenue acts of Great Britain have been modified so as to exclude from duty molasses imported into the country to be used exclusively for feeding stock. An allowance of one shilling per hundredweight is also made to refiners on molasses produced in Great Britain from sugar on which import duty has been paid, if the molasses is to be used as stock food.

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EXPERIMENT STATION RECORD.

VOL. XV. FEBRUARY, 1904. No. 6.

Continental State Aid for Agriculture is the subject of a pamphlet recently received, which deals especially with the matter of government aid in Denmark and Hungary. The author is Mr. T. S. Dymond, lecturer on agricultural chemistry at the Essex County Laboratories at Chelmsford, England.

Mr. Dymond writes from the standpoint of one familiar with the conditions in Hungary from personal observation and study, having recently acted as conductor of a party of English farmers, landowners, and others interested in agriculture who made a tour of that country. His pamphlet will be a surprise to many as indicating how liberally and along how many different lines the Hungarian government is lending its aid to agriculture. These various enterprises are grouped under the general heads of agricultural education, experimental and research work in agriculture, and commercial development.

The system of agricultural education in Hungary includes, as in other European countries, schools of various kinds for elementary and secondary instruction, as well as the higher institutions. For the sons of peasant farmers there are twenty-one tillage schools which give two-year courses of training in practical farming, and in addition a large number of winter schools of agriculture in the villages. Itinerant instruction is also given by a staff of over two hundred traveling lecturers and experts, who for the most part are attached to the agricultural ministry.

Of the higher institutions, the capstone of the system is the agricultural academy at Altenburg. This ranks among the first agricultural colleges of Europe, and is intended for the training of men who are to fill the highest agricultural positions. There are four agricultural colleges intended for the gentry or large farmers, which Mr. Dymond ranks with the very best English colleges. The agricultural academy has an average attendance of about 160 and the agricultural colleges about 125 students each.

The institutions for special industries include the veterinary college at Budapest, "a huge and splendidly equipped institution," an arboricultural college and four schools for forestry, a dairy high school and four schools for dairymen and dairywomen, a horticultural college and five schools for gardeners, schools for poultry farming, bee farming, and meadow culture, and a viticultural course and eight schools for vine dressers.

Included in this system for agricultural instruction is a system o eighty model peasant farms, in as many counties, each equipped witl the implements and stock considered most suitable for its district In 1897 there were only nine of these farms, which indicates th steady growth in this respect. The government also maintains fiv large state farms which, while primarily intended for other purposes also serve for education and demonstration. Parties of farmers ar carried by the railways to these state farms at reduced fares from al over the country. A great agricultural museum is maintained a Budapest, whose educational value was illustrated by the interes taken in it by the party of practical men whom Mr. Dymond con ducted through that country.

"The whole of this enormous scheme is supported and in mos cases maintained by the state. Every year further developments tak place, old institutions are enlarged and new institutions built, and th policy of the government clearly is not to wait till the demand becomes imperative, but, by the provision of the fullest facilities fo instruction, to encourage the people to take advantage of it. In this as in every other agricultural development in Hungary, the govern ment leads the way and the people follow. . . . One important fea ture must be clearly impressed—that in every institution for highe teaching, and even those intended for the training of peasant farmers education is associated with research, it being realized that for th future of agriculture to be prosperous it is important not only to teac the students what is known already, but to impress upon their mind by this association how incomplete is our knowledge and how muc remains to be discovered."

The system for agricultural experimentation in Hungary has bee described in these pages.[a] This is comprehensive and well organized and is said to resemble the experiment station system of this countr more than of any European country

The measures which are taken by the government for the commer cial development of agriculture are especially interesting, both fron the methods followed and the success which has attended them. Th Hungarian government has not hesitated to foster by direct financia aid farming in any depressed part of the country, or any branch o agricultural industry that is capable of development, even to th point of embarking on industrial enterprises itself. In proof of thi may be cited the government ownership of the principal railways and of silk, hemp, flax, sugar, and many other factories in connectio with the state farms, the ownership and management of over thre million acres of forest, and the carrying on "to the highest possibl advantage" of 163,466 acres of land in its five great state farms.

[a] E. S. R., 13, p. 4.

These state farms, often spoken of as stud farms, serve not only as models to the whole country, but they produce the best stallions, the best bulls, and the best seed for distribution throughout the country, thus providing an effectual means for the improvement of stock of various kinds; and in the performance of this service they are so well managed that they are said to yield an annual revenue of a million and a half dollars to the state. More than three thousand stallions are owned by the state and hired out for public service at small fees. These animals are all under military control, and the men of the cavalry regiments serve their three years upon the stud farm, thus not only saving the state a heavy bill for labor, but gaining a large amount of knowledge and experience in horse breeding and management which they are able to turn to account on returning to their own farms.

Equally interesting are the steps taken by the government for the development of cattle breeding, the improvement of dairy cattle, the elimination of contagious diseases, and the fostering care of the poultry industry, for which a state farm and school have been established on the crown estate of Gödöllö. Here the most suitable breeds are reared, and the cock birds are exchanged with the farmers for common poultry. In 1901 nearly eight thousand cocks were sent out in this way, and a similar system of exchange is followed in furnishing eggs for hatching. Local egg-collecting stations have been established, mostly in connection with the local cooperative dairies, which aid the farmers in marketing their eggs. By systematic sorting, and by eliminating the German middlemen, the farmers are able to realize from 30 to 40 per cent more for export eggs. Under this system the exports of poultry and eggs have increased 80 per cent in five years.

To encourage silkworm culture, a home industry said to be carried on by 100,000 peasant families, the state has established 145 nurseries for the propagation of mulberry trees, a silk-breeding station for providing and distributing the eggs, twenty-four cocooneries or depots for collecting the silk, and five silk factories.

While Mr. Dymond admits that this state aid in the commercial development of agriculture has been a gigantic success in Hungary, and that "the country is going ahead by leaps and bounds as a direct consequence," he calls attention to some of its obvious disadvantages. He points out, however, the advantages of the centralized system of agricultural instruction, as applied to the whole country, and draws a comparison between it and the lack of system of Great Britain. In the latter country "it is the system of decentralization, of remitting to the county councils the duties of agricultural education, under which title almost all scientific development of agriculture is now carried on in this country [England], that is the difficulty in the way of the systematic application of any scheme to the whole country. The great

variation in different parts of our country necessitates, of course very different treatment, but the time must surely soon come when the experimental period of agricultural education has proved what the right treatment for each part of the country is, and every county should be persuaded to carry out its share of the work."

Mr. Dymond expresses the belief that the commercial development of agriculture in Great Britain "would take place far more quickly if agricultural education were better systematized in the whole country." Taken in connection with the present agitation for industrial education in England, Mr. Dymond's conclusions from his observations at home and abroad are full of interest. They are in harmony with the trend of thought and the tendencies in this country, where the relation between commercial development in agriculture and agricultural education is becoming more apparent every year.

The recent bulletin of the Vermont Experiment Station on the flow of maple sap is worthy of more than passing notice, both on account of the comparative novelty of the subject and the systematic character of the work which it reports. There has been very little research in this field, and what is known has been gained largely by inference from studies of quite a variety of trees and plants rather than from work done on the sugar maple primarily. This interesting and attractive bulletin of one hundred and forty pages records the most thorough and extensive series of investigations which have been made anywhere on the maple-sugar industry, and occupies a unique place in experiment station literature.

Maple sugar is distinctly an American product, as the sugar maple does not grow in Europe except in the arboretum; and in this country maple-sugar making is confined within rather restricted limits. The product is said to have been known to the American Indians prior to 1673. The art of making it was learned from them by the early Vermont settlers, who depended almost entirely upon the maple for their domestic sugar supply. Indeed, within a generation or so it was used to a considerable extent in place of "sale" sugar in the localities where it was made. Now, however, maple sugar and sirup are regarded as luxuries, commanding a relatively high price and being much sought for by certain people on account of their characteristic flavor; but they are so extensively adulterated and imitated as to make the pure products quite difficult to obtain.

The average annual maple-sugar crop of the United States is placed at approximately forty-five million pounds, although it fluctuates considerably with the season. The census figures show variations from less than thirty million pounds in 1899, which was an unusually poor year, to nearly fifty-three million pounds in 1859. It is made principally in Vermont, New York, Ohio, Michigan, Pennsylvania, and New

Hampshire, in the order named, and brings to the comparatively few farmers operating sugar bushes approximately three million dollars and upward annually. Vermont has long been famed for its maple-sugar industry, and produces from one-fourth to one-third of all the sugar and sirup made in this country. It seems especially appropriate, therefore, both from the standpoint of tradition and supremacy in production, that the Vermont Station should take up the study of this time-honored agricultural industry, and make the phenomena of the flow of sap upon which it depends the subject of scientific investigation.

The work was begun in 1897 and was continued each year for five seasons. This gave opportunity for studying the relations of climatic and other conditions to the flow and sugar content of the sap, and showed how important in this respect is the character of the preceding season. A variety of conditions were also represented in the trees under observation, as to the amount of exposure they were subjected to in groves and in the open, the distribution of the limbs, size of the trees, and other factors likely to have a bearing on sugar production. The studies embraced the physiological problems of sap pressure and flow, including the source and direction of pressure, the relation of tree temperatures, and the direction and rate of movement, as well as a variety of practical problems in the management of the sugar orchard, such as the tapping of trees with reference to the points of the compass, the height on the tree trunk and the depth and size of the orifice, and a variety of other points.

The bulletin clearly shows that certain conditions which influence the production of sugar are within the control of the farmer, and suggests the possibility of improvement in a number of lines. For example, the studies of trees in different locations brought out the marked advantages of exposure to the sunlight to enable the tree to store up during the growing season the starch which is later transformed into sugar. Too thick growth and shading by other trees, notably evergreens, were also detrimental in this respect. Great differences were found between individual trees in regard to the sap flow and its richness in sugar, certain trees yielding much more profitable returns than others. These matters have a practical bearing in the management of sugar orchards, and suggest their own remedies.

The bulletin furnishes a scientific basis for the intelligent discussion of a wide range of practical questions relating to this industry. As such it will serve a very useful purpose, and will help to round out our knowledge in another branch of farm practice.

AGRICULTURAL SCIENCE AT THE ST. LOUIS MEETING.

E. V. Wilcox, Ph. D.,
Office of Experiment Stations.

The fifty-third annual meeting of the American Association for the Advancement of Science, held at St. Louis, December 28, 1903, to January 2, 1904, was the occasion for the presentation of many papers relating to agriculture and agricultural investigation. The most of these were given before affiliated societies—The Society for the Promotion of Agricultural Science, The Society for Horticultural Science, The American Breeders' Association, and The Association of Economic Entomologists, although several papers in this field were presented before the association proper. Mention of the meeting as a whole was made in the last issue (p. 421).

HORTICULTURE.

At the first meeting of the recently formed Society for Horticultural Science, papers of a general nature were presented, in addition to symposia on shading and cover crops. L. C. Corbett discussed Coordinaton of Horticultural work, urging that local problems require special treatment and should be solved largely by local workers, and that in cooperative work a coordination of results must be based on a detailed, uniform system of note taking. Attention was called to the necessity of securing in this manner reliable data on the cultivation and the varieties of common cultivated plants, which the society might well assist in. As a result of this paper a committee was appointed to consider the matter and report at the next meeting.

D. G. Fairchild described the mangosteen and called attention to its value. It was suggested that experiments be made to determine the possibility of growing this fruit in Hawaii, Porto Rico, and perhaps in Southern Florida. The fruit has recently been grafted on a comparatively hardy stock, so that its cultivation in these countries is considered possible. The mangosteen apparently requires a very moist soil. The seeds are planted singly in pots, and the trees should not be transplanted until about 2 ft. high.

R. A. Emerson presented a report on the principles underlying the use of cover crops. Orchards are more easily injured in winter on bare ground than on ground under cover crops. Peaches mature the wood earlier on cover crop plats. Cover crops may decrease the

moisture by transpiration, but may conserve or even increase the moisture by their action as wind-breaks, thus preventing evaporation, and also by the absorptive action of the added humus. They may also prevent loss of heat from the soil and deep freezing. The amount of transpiration of plants under actual field conditions is not known and needs systematic study. Cover crops may be classified in two groups, according as they are winterkilled or not, and their value depends in a considerable degree upon the class to which they belong. In experiments in Nebraska it was found that rye has a drying effect on the soil and that the most successful cover crops are those which are killed by the frost. The roots of fruit trees are hardier in a soil containing 20 per cent of moisture than in one containing 15 per cent. The effect of cover crops in preserving this moisture is therefore very important. Their effect upon soil temperatures is not well understood, but the soil is protected from deep freezing by their presence, especially through their action in holding snow upon the ground. In a comparative test there was 18 in. of snow on ground occupied by cover crops, while check plats showed only 2 in. Dry soils were found to freeze and thaw much more rapidly than wet soils. Cover crops should stand erect. Millet is considered as the best cover crop in Nebraska.

In the symposium on shading L. C. Corbett discussed the practice in a general manner, reviewed the work which has been done in shading tobacco, citrus fruits, studies of humidity and temperature of the soil, and the effect on plant foliage, earliness of crops, and decrease in yields. It was argued that the practice is best applicable to plants grown for foliage. B. M. Duggar called attention to the fact that many studies on etiolation have been published, but few studies on shading from a horticultural standpoint. In general there appears to be more acid in plants under shade and the reserve materials are greatly diminished. Attention was called to the desirability of carrying on quantitative work to determine the amount of transpiration of plants.

The subject of shading strawberries was presented by V. A. Clark and O. M. Taylor. Varieties of strawberries were grown on different soils. In some varieties the yield was increased, in others diminished. When a heavy form of cheese cloth was used in shading in a test of 16 varieties, the yield was diminished 13 to 70 per cent.

P. H. Rolfs discussed the subject of shading pineapples and citrus fruits. This practice was first tested in the South as a protection against frost. It has been found that on light Florida soils shading doubles the amount of soil moisture. Orange trees require considerable light, but shading prevents transpiration and thus partly compensates for the diminished light. In shading the shoots grow longer.

Good results were obtained by the use of a wind-break 20 ft. high. This allows access of light but checks the wind and prevents evaporation. Pineapples grown under shade are larger and the fruit is more tender.

H. J. Webber presented a paper on the growing of tobacco and pineapples under shade. Experiments in shading tobacco in Connecticut have shown that the percentage of lanceolate leaves best adapted for use as wrappers is considerably increased by shading. Experiments are being made for the purpose of obtaining a race of tobacco which will give the desired texture. In a discussion of the subject of shading the fact was brought out that the use of lath lowers the temperature surrounding the plats, while cheese cloth has the opposite effect.

V. A. Clark discussed the subject of Seed Selection According to Specific Gravity. Experiments were made on wheat, grape, and various other seeds. A series of solutions was arranged of different density for the purpose of testing seeds. Variations in specific gravity were found in closely related plants. A correlation was noted between the size and the specific gravity of the seeds, except in the case of the seeds of egg-plant, in which species the largest seeds had a low specific gravity. In tomatoes it was found that dark seeds are of a lower specific gravity than white seeds. A correlation was also noted between specific gravity, rapidity of germination, and viability of seeds. Peas of the low specific gravity were found to be soft, with poorly developed cotyledons. Buckwheat of low specific gravity showed a loose connection between the kernel and seed coats. In general, heavy seeds of all species are of high protein contents.

Several other papers of this society were presented at a joint session with the American Breeders' Association.

PLANT AND ANIMAL BREEDING.

An organization of plant and animal breeders was effected, to be known as the American Breeders' Association. A constitution and by-laws were also adopted and a large programme was presented, including the following papers:

W. Saunders presented an account of wheat breeding in Canada. Advantage was taken of Russian investigations, during which it was found that certain varieties of wheat matured considerably earlier than the average varieties. Ladoga wheat was imported from Russia and crossed with Red Fife. Other varieties were also imported from Russia and India from low and high altitudes. The Preston wheat, obtained by crossing Ladoga and Red Fife, ripens earlier than Red Fife and yields better. Later a bald variety called Stanley was obtained. Experts in England and Minneapolis score Red Fife, Stanley and Preston about the same. Great increase in the gluten content

was observed in the cross between the Russian and Indian varieties of wheat known as Early Riga.

H. J. Webber discussed the work of plant breeding in the Department of Agriculture. This work began in 1893. The chief lines are improvement of cotton, increased resistance of cereals to alkali, breeding oats, potatoes, tobacco, corn, and wheat, and increasing plant resistance to disease. Cotton with a long staple makes a better yield and a more durable fabric, and in general black seeds are desirable. Attempts are being made to secure Sea Island cotton with a larger boll which will open well and render picking easy. Nearly all crosses between the upland and Sea Island cotton are larger than either parent, while the Egyptian variety is comparatively long in staple and not too fine in fiber.

E. Davenport discussed the subject of Thremmatology, which was defined as meaning evolution as encouraged by man. The causes of variation and heredity were examined. A paper by H. De Vries on Investigation of Heredity in Sporting Varieties was presented by the secretary of the association. Attention was called to the desirability of studying the diversified forms of sporting varieties, on account of the possibility of finding accidental types exhibiting desired characters. These variations arise from internal and external causes not wholly understood, but such monstrosities may assist in throwing light on the causes of variation.

C. S. Scofield described a system of score cards adapted to the use of breeders. A general review was presented of the problem, and attention was called to the desirability of devising score cards which would allow for a detailed description of the variety of plant which was being studied. These cards should not be made too comprehensive, but are perhaps most valuable when adapted simply to a single species.

J. D. Funk spoke on Commercial Corn Breeding. A corn breeder should have only one aim, viz, increased production. The selection of the most productive ears from comparative breeding tests constitutes the essential part of the speaker's system of breeding. The breeding fields were described in detail. All defective stalks are detasseled. Brief mention was made of the possible increase of oil and protein content in corn. During the numerous tests made by the speaker only 2 strains of corn have been developed with remarkably high yields. By the use of seed corn obtained from these strains the average crop has been increased about 10 bu. per acre. Satisfactory reports have been received from this corn wherever it has been planted in the central corn belt. The speaker considered increased production as immensely more important than changes in chemical composition.

C. P. Hartley discussed the subject of Corn Breeding. Attention was called to the fact that all varieties of corn cross readily, and that

therefore in breeding experiments careful isolation of the plats is necessary. Crosses with Mexican varieties of corn are found very unproductive, or even sterile, while crosses between sugar corn and field corn sometimes show a blending of starchy and sugary parts in the same kernel. The starchy tendency, however, is the dominant character and prevails in three-fourths of the offspring. The dark color in corn has a tendency to show at the base of the kernel. In a test with red ears it was found that certain ones produced 100 per cent of red corn in the third generation.

D. G. Fairchild discussed the subject of Plant and Animal Introduction, calling attention to the work which the Department of Agriculture has been doing in agricultural explorations throughout the world. The possibility of breeding plants resistant to disease was discussed by W. A. Orton, who referred to the results already obtained in breeding watermelons resistant to wilt, potatoes resistant to Phytophthora, cowpeas and cotton resistant to wilt.

F. B. Mumford presented a paper on The Influence of the Size of the Parent on Birth Weight. During the speaker's experiments it was found that the sire has but little influence on the birth weight of the progeny. The influence of the male as to size and other characteristics of the offspring appears not to be manifested conspicuously until after the birth of the young. Evidence was obtained that certain characteristics of the parents never appear until late in the life of the offspring.

C. F. Curtiss spoke of some breeding experiments with domestic animals. An attempt is being made to produce a race of sheep especially adapted to western ranches, and Shorthorn cattle are being crossed to produce blue-gray hybrids. A number of other papers were presented, especially on Distributing Valuable New Varieties and Breeds, by W. M. Hays; Experiments in Corn Breeding, by C. G. Hopkins; Breeding from Tame *v.* Wild Species, by H. W. Groff; Theoretical Studies in Breeding, W. J. Spillman; Relation of Life History Studies to Breeding, by W. T. Swingle; Grape Breeding, by S. A. Beach; Breeding Hardy Fruits in the Northwest, by N. E. Hansen; Bean Breeding, by R. A. Emerson; An Application of the Theory of Evolution to Breeding, by O. F. Cook; and Studies in Inheritance in Mice, by C. B. Davenport.

Secretary Wilson was elected president of this association, and W. M. Hays secretary, with H. J. Webber as chairman of the plant section and J. Dryden as chairman of the animal section.

SOCIETY FOR THE PROMOTION OF AGRICULTURAL SCIENCE.

This society held a number of sessions, alone and in conjunction with the Society for Horticultural Science and the Association of Economic Entomologists. L. H. Pammel presented an account of

Some Unusual Plant Diseases in Iowa. Notes were given on the occurrence and prevalence of *Cylindrosporium padi*, septoria disease of currants and gooseberries, black knot, and the bacterial carrot disease. The latter was said to be very prevalent during the season of 1903.

The Water-Soluble Plant Food of Soils was discussed by H. Snyder. Data were presented showing the amount of phosphoric acid removed from the soil by wheat and several other crops at different stages of growth. In a specific instance the amount of wheat growing on 1 sq. yd. of soil contained 1,106 gm. of dry matter and 10.18 gm. of phosphoric acid. It was shown that the amount of water which, according to Hellriegel, would be required to produce this 1,106 gm. of dry matter in wheat, "could dissolve only 1.9 gm. of phosphoric acid from the soil upon which the wheat was grown," using the methods for extracting given in Bulletin 22 of the Bureau of Soils, except that the water was left in contact with the soil for 15 days instead of 20 minutes. The conclusion was drawn that over 81 per cent of the phosphoric acid of the wheat crop was secured from forms insoluble in water. It was calculated that the wheat crop mentioned in Bulletin 22 would require more water-soluble phosphoric acid than was contained in the soil to a depth of 8 ft., and the limit to the capacity of crops for absorbing water was pointed out.

J. B. Weems presented a paper on The Relation of Research to Scientific Agriculture, referring to the necessary mental and physical equipment of investigators, and discussing the difficulties met with by many. The responsibility of overloading promising investigators with tedious routine work was placed upon those in authority at various institutions.

C. E. Bessey presented an informal account of agriculture in the Caucasus Mountains. The geography and general topography of the country were described. The steppes north of the Caucasus are like the Great Plains of America. The chief crops are hay, wheat, and corn. Improved farm machinery are in use and the cattle are of fair conformation. The sheep are of a very dark color. The Caucasus Mountains are occupied by farmers who raise wheat, rye, and barley. South of the Caucasus corn is grown extensively, and there are improved races of hogs and horses, and also the big-tailed sheep.

The Relation of the Date of Digging to the Development of Potato Rot was discussed in a paper by L. R. Jones and W. J. Morse. During the reported experiments it was found that sound tubers were not infected during storage. It was determined that there is more loss from rot in early digging than in late digging.

W. R. Lazenby discussed The Waste Products and the Keeping Quality of Apples. During the speaker's experiment 25 standard varieties of apples were tested to determine the percentage of waste.

The average waste was found to be 23 per cent. Another test with carefully selected apples showed a waste of only 13 per cent. The percentage of water was found to be highest in the best samples of apples (90 per cent), while it was 85 per cent in the second grade and 81 per cent in cull apples. Apples were picked, beginning the middle of September, and every week thereafter, until November. This test was made on 10 varieties and the samples were stored in the cellar. Neither the earliest nor the latest picked apples kept longest, and apparently the best time for picking apples in Ohio is about the middle of October.

In a discussion of the paper attention was called to the fact that this work corroborated the work of this Department in storing apples, and the further fact was brought out that some varieties must be picked early in the morning in order to keep best.

D. G. Fairchild presented a paper on Hop Culture in Europe. In America male hop plants are numerous, while in Europe the male plants are not tolerated in the hop field. It was argued that the variety of hop is of more importance than the soil or climatic conditions. Little work has been done along this line, and the field of hop breeding is therefore open.

Various other papers presented before this society are noted elsewhere.

BOTANY.

A large programme of botanical papers was presented before Section G of the association, the Botanical Society of America, and other bodies. B. T. Galloway gave an address as past-president of the Botanical Society of America, on the subject of the Twentieth Century Botany. The advances thus far made on the subject of botany were outlined in a general manner, and special attention was given to a discussion of the present requirements of the botanist and the problems to be solved in the future. The speaker urged the consideration of botanical questions from a practical view-point, and stated that the doctrine of science for science's sake is less applicable at present than in the past. It was also argued that a successful scientist should be a practical man of affairs, possessed of an abundance of common sense. The dangers of too great specialization and consequent limitation of view were pointed out. The speaker stated that important advances in the future are to be expected in morphology, physiology, and pathology.

J. H. Harris presented a paper on The Dehiscence of Anthers by Apical Pores. Most plants which possess this character occur in South America, there being 1,200 species in that country, and only 400 in the rest of the world. Its importance is not clearly understood, but according to investigations thus far pursued it appears to be closely correlated with the distribution of bees, and is therefore apparently an arrangement to favor cross-fertilization by this method.

Among other botanical papers of economic importance may be mentioned The Distribution of Some Iowa Plants, by L. H. Pammel; Unpublished Notes on the Uredineæ, by M. A. Carleton; The Histology of Insect Galls, by M. T. Cook; and The Type of the Genus Agrostis, by A. S. Hitchcock.

ECONOMIC ENTOMOLOGY.

The entomological papers were presented before the Society for the Promotion of Agricultural Science, and the Association of Economic Entomologists. L. O. Howard gave an account of the work of the Department in combating the cotton-boll weevil. This work has been prosecuted for a number of years, and has included experiments with a number of insecticides and a test of cultural methods. The results thus far obtained indicate that by proper attention to cultural details a fairly successful crop of cotton can be produced, even in the worst infested localities. The outlook is therefore not believed to be so gloomy as has sometimes been supposed.

A paper on the same subject was presented by E. D. Sanderson, who outlined the work of the Texas Station in combating this insect. Attention was called by this speaker also to the desirability of combining proper cultural methods with insecticide treatment. No cotton plants should be allowed to stand in the fields over winter, and other material in which the weevil could be successfully concealed or carried from place to place should be destroyed.

The same speaker discussed a card index system for entomological records. The literature of this subject was briefly discussed, with special reference to schemes for keeping a correspondence record, accessions catalogue, and an experiment record.

F. M. Webster discussed the subject of Buffalo Gnats in the Mississippi Valley, with special reference to the life history of these insects. Gnats are most abundant along the Mississippi between Cairo and New Orleans. A historical account was given of the various outbreaks of this pest, with statements of losses. The gnats are most prevalent in years of high water. There appear to be two forms of female, one sterile and one fertile. The sterile female is apparently the only form of gnat which wanders far away from water courses and is the one to which the losses of stock are due. The worst outbreaks of this insect are due to overflow from the Mississippi, and these outbreaks have become less frequent and less serious since the establishment of substantial levees.

C. P. Gillette spoke on The Insects of the Year in Colorado. Grasshoppers were very numerous and experiments were made with fungi in controlling them. Apparently the Australian grasshopper fungus was quite ineffective, while *Empusa grylli* destroyed a number of grasshoppers. The speaker tested the use of a mixture of horse

manure and Paris green without very good results. Army cutworms occurred in unusual abundance. There were 2 broods of this species. Notes were also given on gooseberry fruit worm, plant lice, and false chinch bugs.

W. Lockhead discussed Injurious Insects of Ontario. The Hessian fly and pea weevil were unusually abundant. It was stated that there are many voluntary observers studying the habits of these insects. The pea weevil can now be controlled by proper insecticide and cultural methods. The clover-seed midge destroyed about one-fourth of the clover seed of Ontario, and is considered a very serious pest. The lime-sulphur-salt treatment was found to be exceedingly effective for San José scale and pear psylla. Notes were also given on squash bug, asparagus beetles, and cucumber beetles.

J. Fletcher spoke on The Insects of Canada. Clover thrips is always abundant on clover blossoms in Canada, but it is not certain how much injury this insect does. It apparently damages oats. Notes were presented on oyster-shell bark-louse, asparagus beetles, cutworms, pear-leaf blister-mite, cabbage maggots, onion maggots, horn-fly, fleas, and bedbugs. The author argued that all insecticide formulas must be made as simple as possible in order to induce farmers to apply them properly.

H. Osborn discussed Ohio insects with special reference to fall webworm, apple maggot, Capsidæ, and leaf hoppers.

E. D. Sanderson spoke of the injurious insects of Texas for 1903. There are apparently 3 species of grain plant lice in Texas. The chinch bug has 3 broods and is reported to have caused considerable loss during the year. Insect injury to cotton was chiefly due to grasshoppers, white grubs, white-lined sphynx, and *Loxostege similalis*. Pecans were injured by a species of Phylloxera and by *Acrobasis caryæ*. Notes were also given on the fowl tick, sweet-potato weevil, and *Aphis scotti*, which was referred to as a new species injurious to plums.

T. B. Symons discussed the Maryland insects. The San José scale is now controlled by lime-sulphur-salt wash. Economic notes were given on apple aphis, strawberry weevil, fruit-tree bark-beetle, tent caterpillars, cucumber beetles, asparagus beetles, melon aphis, strawberry aphis, scurfy bark louse, and oyster-shell bark-louse. The cigarette beetle was said to be in almost every tobacco warehouse in Maryland and great difficulty has been experienced in exterminating it. The speaker recommended a regular inspection of tobacco warehouses.

F. L. Washburn spoke of injurious insects in Minnesota. Notes were given on plant lice and white grubs, especially *Lachnosterna rugosa*, which were said to be unusually abundant and injurious to sorghum, wheat, barley, evergreen trees, and other plants. Mention

was also made of the injuries from grasshoppers, chinch bug, and Hessian fly. Some evidence was presented by the author for the apparent occurrence of 2 broods of this insect in Minnesota.

M. V. Slingerland gave an address on Insect Photography. The history of the work was outlined, with special reference to the development of microphotography and half-tone work. Attention was called to the occasional abuse of photography in scientific work, and suggestions were given regarding the field of greatest usefulness of photography in illustration. Necessary apparatus and methods of preparing specimens were outlined.

The same speaker gave an account of New York grape pests, with special reference to the grape-root worm and grape-leaf hopper. Experiments in spraying with arsenate of lead gave promising results in controlling the root worm. The leaf-hoppers were successfully captured by the use of a large sticky shield, or were destroyed by a weak oil or soap spray. The grape fruit moth can be controlled by hand picking. Infested fruits may be recognized and picked off for about $2 per acre. The same speaker also presented a general paper on insect depredations in New York, with special notes on plant lice, pear psylla, slugs, rose chafer, cabbage maggots, onion maggots, plum curculio, apple bucculatrix, and apple-leaf blister-mite.

Arsenate of Lead as a Remedy for Codling Moth was the subject of a paper by A. F. Burgess. Experiments were made on an orchard of 1,700 trees. Without treatment only one-fourth of a crop had been obtained. Disparene and arsenate of lead were used, being applied 3 times. The quantity of perfect apples varied from 7 to 81 per cent, while the cost of application ranged from 7 to 13 cents per tree.

The same speaker discussed the treatment of nursery buds. Peach buds were fumigated with hydrocyanic-acid gas or were dipped in whale-oil soap. The buds were not injured by either treatment. The gas was found to be very effective in killing the San José scale while whale-oil soap was less so. The speaker also presented a paper on economic insects in Ohio for 1903, with special reference to chinch bug, Hessian fly, apple aphis, cankerworm, white grubs, grape-root worm, woolly aphis, San José scale, grape berry moth, willow curculio, and oyster-shell bark-louse.

F. M. Webster discussed the relation of the systematic and the economic entomologist. The systematist may greatly assist the economic entomologist in identification of species. Attention was called to the great need of care in description of species. Mention was made of nomenclatural troubles and uncertainties. The same speaker presented a paper relating to the distribution of *Myochrous denticollis*, *M. squamosus*, asparagus beetles, and harlequin cabbage bug.

C. P. Gillette discussed the question of what credit is necessary to be given. Attention was called to the difference between skilled and

unskilled assistants, and it was urged that original and independent work of assistants was most worthy of recognition and personal credit in the publication of entomological literature.

O. H. Swezey discussed the life history of *Liburnia campestris*. It was found that the larvæ appear about 2 weeks after the time of pairing of the adult insects. The young nymphs reach full growth in about 6 weeks. *L. lutulenta* was compared with the above species and notes were given on hymenopterous parasites of this insect.

The sessions of Section I on Social and Economic Science, were devoted to the labor problem; the economic aspects of the new agriculture; the status of instruction in social and economic science in schools, colleges, and universities; and on commerce, finances, and government. The session which proved to be most interesting and developed the most lively discussion was that on the economic aspects of agriculture, previously referred to (p. 422).

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Chemical methods for the determination of the fertility of the soils with respect to phosphoric acid, K. K. Gedroitz (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 4, pp. 403–432*).—The author reviews his previous investigations on this subject, and reports further pot experiments with oats and mustard on 19 widely different soils. The pots contained 5 kg. of dry soil and were fertilized with various amounts and combinations of nitrogen, phosphoric acid, potash, and lime.

The phosphoric acid was determined separately in the straw and grain of the harvested crops, as well as in the roots in a few cases. The solubility of the phosphoric acid of the soil in 2 per cent citric and acetic acids was also determined. From a comparison of the data thus obtained the conclusion is drawn that plants vary widely in their capacity for utilizing the phosphoric acid of the soil. There was no close agreement between the amounts utilized by the oats and mustard on the same soil, and similar results are reported for 12 different kinds of plants grown on the same soil, namely, sandy chernozem.

It was further shown in studies on 19 different samples of soil that there was no agreement between the availability of the phosphoric acid of the soil as measured by solubility in 2 per cent citric or acetic acid and the amounts taken up by plants. In studies of the relative assimilability of the phosphates of iron, aluminum, and calcium by flax, oats, and mustard, as compared with their solubility in citric and acetic acids, it was found that as regards the yield produced the relative efficiency of these phosphates was, beginning with the highest, aluminum phosphate, calcium phosphate, and iron phosphate. As regards solubility in 2 per cent acetic acid, the order was calcium phosphate, aluminum phosphate, and iron phosphate, the latter being almost insoluble in acetic acid. The aluminum and calcium phosphates were about equally soluble in 2 per cent citric acid, thus showing a closer agreement with the actual availability of these phosphates as determined by means of the plant.—P. FIREMAN.

Studies in soil analysis, A. Atterberg (*K. Landt. Akad. Handl. och Tidskr.*, *42* (*1903*), *No. 3, pp. 185–253*).—A discussion of methods of mechanical soil analysis, and suggestions for a new terminology of soil grains. The relation of soil particles of different diameters to hygroscopicity, air content, volume, weight, capillarity, etc., were studied experimentally, as well as the rapidity of drying out, the flocculation of fine sand grains, the relation of sandy soil to plant roots, etc.—F. W. WOLL.

On recent efforts to simplify soil analysis, Emmerling (*Oesterr. Chem. Ztg.*, *6* (*1903*), *No. 18, p. 412*).—This is a brief note on an address before the International Congress of Applied Chemistry at Berlin in 1903, and refers to Rodewald's method of determining the fineness of the particles of a soil by means of its hygroscopicity, the importance of the determination of the loss on ignition, the comparatively little value of determinations of nitrogen by means of the Kjeldahl method, and the substitution of weaker solvents for stronger acids like hot hydrochloric acid in the chemical analysis of soils.

Chemical analysis of soils, R. CORRADI (*Bol. Chim. Farm., 42 (1903), pp. 482–486; abs. in Chem. Centbl., 1903, II, No. 14, p. 805*).—In continuation of a previous article (E. S. R., 14, p. 834) the author describes methods of determining chlorin and manganese and explains a correction for the presence of coarse particles. Some results of examination of samples of Sicilian soils rich in lime and poor in nitrogen are reported, and the general subject of fertilizer requirements of soils is discussed.

Contribution to the knowledge of the molybdo-phosphoric acid reaction, C. REICHARD (*Chem. Ztg., 27 (1903), No. 68, pp. 833–835*).—This is an account of a study of this reaction under varying conditions of proportion of reagents and presence of certain acids (hydrochloric, tartaric, citric, and oxalic). The results obtained indicate that the molybdic reagent used in amounts furnishing as much as 30 parts of MoO_3 to one part of P_2O_5, in case of solutions containing as little as 0.000186 gm. of phosphoric acid per cubic centimeter after several hours' standing, gives no trace of a precipitate. In the majority of cases to insure the precipitation of one part of P_2O_5, it is necessary to add 200 parts of ammonium molybdate, and that the solution of molybdate should be of at least 4 per cent strength.

The presence of hydrochloric acid was found to seriously interfere with the formation of the yellow precipitate, but this was overcome by neutralization, preferably with ammonia. Dilute solutions of the acid interfered more with precipitation than stronger solutions. The organic acids were variable in their behavior toward the reaction, but in all cases interfered with precipitation. Oxalic acid was especially marked in its preventive action. Neutralization of the organic acids in a measure prevented interference with precipitation, and it appeared to be immaterial whether ammonia or the other alkalis were used for this purpose.

A method for the estimation of chlorids, bromids, and iodids, S. BENEDICT and J. F. SNELL (*Jour. Amer. Chem. Soc., 25 (1903), No. 11, pp. 1138–1141*).—In continuation of a previous article (E. S. R., 14, p. 225) the authors outline the following method for the determination, either gravimetrically or volumetrically, of the 3 halogens:

"For the determination of the iodin, a suitable quantity of the substance (containing not over 0.5 gm. iodin or 0.15 gm. chlorin, if tenth-normal solutions are to be used) is dissolved in water and made up to about 50 cc. in a 100 cc. glass cylinder with close-fitting glass stopper. Neutral potassium iodate is added in about twice the quantity necessary to react with all the bromin and iodin believed to be present. The mixed solution is acidified with 4 or 5 cc. fifth-normal (30 per cent) acetic acid and shaken with 30 to 40 cc. carbon bisulphid until all the liberated iodin has been taken up by the latter. The aqueous phase is now separated from the carbon bisulphid phase by filtration through a wet filter, and the carbon bisulphid is thoroughly washed with cold water on the filter. The filtrate and washings are reserved for the chlorin determination. The carbon bisulphid solution is transferred to another beaker by puncturing the filter and is covered with 20 to 25 cc. of 75 per cent alcohol. Any carbon bisulphid left adhering to the filter is rinsed down into the beaker with a portion of the 75 per cent alcohol. The iodin is now titrated with sodium thiosulphate with constant stirring. No starch indicator is necessary.

"For the determination of the chlorin, the aqueous filtrate from the carbon bisulphid is treated with 5 cc. fifth-normal nitric acid (sp. gr. 1.18) to liberate the bromin and is boiled in a covered beaker until colorless. The excess of iodate is next destroyed by adding a quantity of potassium iodid slightly in excess of the amount necessary to react with it. The solution is again boiled until colorless, 2 or 3 cc. more of the dilute nitric acid being added, if the color is not completely discharged after 10 or 15 minutes' boiling. A minute or two after the color has completely disappeared the solution is taken from the flame, cooled, and neutralized with sodium carbonate. To secure exact neutralization, a little calcium carbonate may be added at first and

then sodium carbonate solution until a precipitate just forms. The chlorin is then determined by titration with standard silver nitrate, using potassium chromate as indicator."

The results of 12 analyses of mixtures of potassium iodid and bromid and sodium chlorid are reported. These show a very close agreement between the calculated and determined amounts of the halogens.

On the formation of nitric acid by electrical energy, C. W. VOLNEY (*Trans. Amer. Electro-Chem. Soc., 1903, pp. 285–289; abs. in Jour. Chim. Phys., 1 (1903), No. 4, p. 325*).—In experiments to determine the rapidity of decomposition of NO into NO_2 and N by means of electrical discharges, the following results were obtained: In 5 minutes 2.7 per cent, in 10 minutes 3.3 per cent, in 20 minutes 3.58 per cent of NO was decomposed. Various equations explaining the reaction are given.

The oxidation of atmospheric nitrogen by electrical discharges, F. VON LEPEL (*Ber. Deut. Chem. Gesell., 36 (1903), pp. 1251–1260; abs. in Jour. Chim. Phys., 1 (1903), No. 4, p. 310*).—After a brief review of the work of other investigators on this subject, the author describes a large series of experiments made to determine the influence of various factors, such as the nature of the electrodes, the rapidity of rotation of the anodes, and the nature of the solution in the apparatus, upon the production of nitric acid by means of a continuous current.

The determination of nitrogen by the Kjeldahl method, S. P. L. SÖRENSEN and C. PEDERSEN (*Ztschr. Physiol. Chem., 39 (1903), No. 6, pp. 513–525, fig. 1*).—The Kjeldahl method was found to give good results with such substances as creatin, creatinin, and uric acid. The results, however, were believed to be a little too low; while those by the Dumas method was considered a little too high.

Methods of analysis of separator skim milk, C. BARTHEL (*Nord. Mejeri Tidn., 18 (1903), No. 35, pp. 71, 72*).—A comparison of the Adams and Gottlieb methods for the analysis of skim milk. The results presented show that if the fat content in the skim milk is greatly increased through the application of self-cleaning pasteurizers, the stirrer of which is turned at a considerable speed, the Adams method fails to show any appreciable increase in the percentage of fat in the skim milk, while Gottlieb's method gives all the fat contained therein.—F. W. WOLL.

A further contribution to the methods of fat determination, M. MÜLLER (*Fühling's Landw. Ztg., 52 (1903), Nos. 21, pp. 767–771; 22, pp. 831–834*).—The author found it extremely difficult, if not impossible, to prepare casein free from fat by ordinary methods of fat extraction. In tests with casein, beef, and yeast the Lehmann method was considered the most satisfactory. The Soxhlet method gave results much too low, and the Dormeyer method much too high. The percentages in the case of yeast were 1.891 by the Soxhlet method, 4.908 by the Lehmann method, and 5.456 by the Dormeyer method. In tests with the brains of horses the results by the 3 methods were respectively 49.924, 50.192, and 50.75 per cent. The 3 methods were therefore considered of nearly equal value on substances rich in fat.

Olive oil and its substitutes, L. M. TOLMAN and L. S. MUNSON (*U. S. Dept. Agr., Bureau of Chemistry Bul. 77, pp. 64, pls. 2*).—The nature and extent of the investigation reported in this bulletin are outlined in an introductory note by W. D. Bigelow, Chief of Food Laboratory. The bulletin proper contains statistics of the olive-oil trade; an account of the manufacture of olive oil; the methods of analysis used, with a full discussion concerning the interpretation of results; and analyses of a number of salad oils sometimes fraudulently substituted for olive oils, olive oils of known origin, and of commercial olive oils.

A briefer account of the work relating to the pure olive oils and the olive oil substitutes has been noted from another source (E. S. R., 15, p. 223). The bulletin is summarized by the authors as follows:

"(1) The olive oil consumed in this country is largely imported from France and Italy. The amount produced in California is relatively small, although reports warrant the statement that California is capable of supplying the entire home demand.

"(2) The cost of production of California oil is so much higher than that of the French and Italian oils that it competes with difficulty with the imported oils in the American market, even after the latter have paid duty amounting to 50 cts. per gallon.

"(3) The retail prices of the best grade of oil from the 3 sources are much the same, but the average prices of the imported oils are much less than that of the California oil, owing to the large amount of lower grade foreign oils that is marketed in this country.

"(4) In the examination of olive oils for adulteration, a complete analysis is usually necessary to reveal the real nature of the oil. In cases of gross adulteration the qualitative tests, specific gravity, and index of refraction will often show the nature of the adulterant and the extent to which it is employed.

"(5) The adulteration of foreign oils imported into this country is practiced to a much less extent than is popularly supposed. Only 5 of the 61 samples obtained from the custom officers were found to contain other than olive oil, and none of these contained cotton-seed oil.[a] On the other hand, oils bought upon the market, bearing labels indicating a foreign origin, were found to be quite extensively adulterated with cotton-seed oil. It seems, therefore, probable that these adulterated oils bearing foreign labels are labeled and modified after leaving the port of entry, neither the domestic nor the foreign producer being responsible for them. This practice is equally injurious to the interests of the Calfornia, French, or Italian manufacturer of pure olive oil and the consumer.

"(6) The results of analyses of oils of known purity show that there is a wide range in the various values ordinarily considered of importance in indicating the purity of an oil. This is especially true of the iodin number, the melting point of fatty acids, and the percentage of solid fatty acids. The California olive oils generally have a higher iodin number, a lower melting point of fatty acids, and a lower percentage of solid fatty acids than the French and Italian oils.

"(7) All samples containing other than olive oil were sold as pure olive oil, although in one case a careful observation of the label revealed the fact that the oil was an olive-oil substitute."

The estimation of moist gluten in flour, M. Arpin (*Ann. Chim. Analyt., 7 (1902), Nos. 9, pp. 325–331; 10, pp. 376–381; 11, pp. 416–420; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 21, pp. 1004, 1005*).—A study of the errors involved in estimating moist gluten and similar problems led the author to the conclusion that the method is so subject to error as to make it quite unsatisfactory, and he recommends abandoning the estimation of moist gluten and falling back on the nitrogen content of flour as a means of judging of its gluten content.

Colorimetric determination of chlorophyll in different plants, B. Jönsson *Bihang K. Svenska Vetensk. Akad. Handl., 28 (1902), III, No. 8, App., pp. 30, pl. 1*).

Report on the examination of foods, drugs, and public water supplies, R. O. Brooks (*Trenton, N. J.: State Lab. Hyg., Chem. Dept., 1903, pp. 30*).—Of the 341 samples of foods examined, 40.8 per cent was found adulterated. The percentage of adulteration of drugs was much higher. Analyses of 19 samples of water are given.

The theories of indicators, J. Stieglitz (*Jour. Amer. Chem. Soc., 25 (1903), No. 11, pp. 1112–1127*).—This article discusses (1) the chemical changes involved in the change of color of indicators and (2) the cause of the characteristic differences in sensitiveness of such indicators as phenolphthalein and methyl orange toward various acids and bases.

Under the first head the ionization theory of Ostwald and the chromophoric theory are considered. The first is considered inadequate, ionization and change of

[a] Two samples recently received from the custom-house have contained cotton-seed oil.

color being in the opinion of the author merely a coincidence. The conclusion is reached that "the color change must be primarily due to a change of constitution involving a chromophoric complex."

It is held that as regards the sensitiveness of indicators "too much emphasis can not be laid on the fact that the lack of sensitiveness of phenolphthalein in laboratory practice in the titration of a weak base like ammonia or of methyl orange in the titration of a weak acid like acetic acid is ultimately due chiefly to the fact that a weak base or a weak acid is very much weaker (less ionized) in the presence of its own salts than in pure aqueous solutions."

The testing of chemical reagents for purity, C. KRAUCH, trans. by J. A. WILLIAMSON and L. W. DUPRÉ (*New York: D. Van Nostrand Co., 1903, 3. ed., pp. 350*).—This is an authorized translation of the third edition of this work, containing many additions and corrections as well as references to English works, in place of many of the original references to German works.

Comparison of different types of calorimeter, J. S. S. BRAME and W. A. COWAN (*Jour. Soc. Chem. Ind., 22 (1903), No. 22, pp. 1230–1233, fig. 1*).—Comparative tests of the Lewis Thompson, William Thomson, F. Fischer, and Mahler bomb calorimeters with reference to their use in determining the calorific power of fuels (coal) are reported. The Mahler calorimeter gave the most satisfactory results.

A new form of platinum resistance thermometer, specially adapted for the continuous-flow calorimeter, H. T. BARNES and D. MCINTOSH (*Phil. Mag. and Jour. Sci., 6. ser., 6 (1903), pp. 350–352*).

Fourth session of the International Commission for Uniform Methods of Sugar Analysis, F. G. WEICHMANN (*Jour. Amer. Chem. Soc., 25 (1903), No. 11, pp. 1208–1215*).—A summary of the proceedings of the session held at Berlin, June 4, 1903.

Report of the principal chemist upon the work of the government laboratory for the year ended March 31, 1903, T. E. THORPE (*London: Govt. Lab., 1903, pp. 26*).—A brief summary is given of the work of this laboratory in connection with the revenue departments (customs and excise) and with other government departments.

Report of the chemical department of the Royal Agricultural Academy, 1902, H. G. SÖDERBAUM (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 2, pp. 103–121, figs. 3*).—Of the subjects investigated by the department during the year and treated in this report, mention may be made of experiments to determine the content of assimilable plant food in a soil through treatment with very dilute acids; the effect of increasing quantities of nitrate of soda on the quantitative and qualitative development of sugar beets on Gottland marsh soils; culture trials with barley on clay soil from Ultuna; determination of the lime content of oats grown on limed and unlimed soil; culture trials with precipitated phosphate of calcium manufactured through electrolysis, for the determination of its value as a fertilizer for peas; culture trials with oats, with a view of determining the effect of increasing lime fertilization with different phosphatic fertilizers; culture trials with oats for the purpose of determining in how far the action of different phosphatic fertilizers depends on the character of the nitrogenous fertilizers applied at the same time; and analysis of Rippert's preservative for barnyard manure. The usual accounts of the administration of the department, officers, donations, etc., completes the report.—F. W. WOLL.

BOTANY.

Botanical work in the Philippines, E. D. MERRILL (*Philippine Bureau Agr. Bul. 4, pp. 53, pl. 1*).—An account is given of investigations on the Philippine flora between 1611 and the present day. This report includes notes on the investigations of the Spanish botanists, as well as the botanical work published on the Philippine flora in Europe and America, together with sketches of the herbaria, libraries, and

botanical gardens of Manila. Notes on the work accomplished since American occupation and a bibliography of the more essential books relating to the botanical work in the Philippines are also given.

A study of the distinguishing characteristics of oat varieties, DUFOUR and DASSONVILLE (*Rev. Gén. Bot., 15 (1903), No. 175, pp. 289–309, figs. 3*).—The authors have made a botanical study of color, awns, size, form, weight, proportion of seed to chaff, size of pedicels, and the cicatrix at the base of the grain, as characters for the differentiation of the numerous varieties of oats. They conclude that there is no one character upon which to base varietal differences, but that many varieties may be distinguished by a combination of characters.

The color of the grain is one character which is the most easily recognized and one of the most important, but in using this character for the differentiation of species it is necessary to consider the color of the grain in mass rather than that of individual seed since slight variations are frequently noticed in individuals of the same variety.

Descriptions are also given of the seed of a number of other species of Avena and directions given for distinguishing them from those of *A. sativa.*

The effect of gases and fumes upon cultivated plants, U. BRIZI (*Staz. Sper. Agr. Ital., 36 (1903), No. 4–5, pp. 279–384, pls. 2, figs. 4*).—Attention is called to the effect of gases and fumes from various industrial establishments, such as gas works, chemical works, smelters, foundries, etc., in their bearings on crop production, as well as the important legal aspect of the subject. A review and summary is given of considerable literature relating to the subject, and the author gives the results of his observations and experiments along this line.

The effect of sulphur dioxid, sulphurous and sulphuric acids, hydrochloric acid, fumes of various minerals, such as arsenic, zinc, mercury, etc., the vapors arising from the manufacture of superphosphates and sulphuric acid, nitric fumes, coal smoke, illuminating gas, etc., upon a large number of economic plants is shown, and experiments are reported which were conducted to discover, if possible, some means of preventing or moderating the injurious effects produced by these agents. Many of the gases, especially the sulphurous and hydrochloric acids, rapidly plasmolyze the cell contents of the plant, causing a discoloration that is often mistaken for a fungus attack, and finally result in the disorganization of the chloroplastids. Coal smoke was found to be injurious principally from the mechanical effect of its deposition on foliage, although the gases often had an important effect on the plants. A bibliography of more than 100 titles completes the paper.

Influence of medium on the acids of plants, E. CHARABOT and A. HÉBERT (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 17, pp. 1009–1011*).—After briefly summarizing previous investigations regarding the formation of ethers, alcohols, and acids in plants, an account is given of the author's investigations on the influence of the medium in which plants are grown on the volatile acids which they contain. At the same time the variation in the alkalinity of the ash of the plants was studied.

The experiments were made on peppermint cultivated in soils to which different mineral salts were added, and the results compared with check plants grown in the standard soil. The quantity of volatile acids was determined in leaves from different parts of the plant and the averages taken.

In general it was found that mineral salts added to the soil increased the amount of volatile acid in the fresh leaves, but this difference seemed to be apparently due to differences in the hydration of the plants. It was less noticeable when compared with the dry weight of the leaves. It was found that the chlorids and sulphates slightly increased the proportion of volatile acid to dry weight of the leaf, the nitrates reducing it slightly, while disodium phosphate increased the proportion very materially. Tables are given showing the proportion of the volatile acids to the total acid of the plants. The salts which favor the reduction of water in the plants tended to increase the proportion of volatile acids to the total acids.

In considering the effect of different salts on the ash, the authors found that at the beginning of plant growth the ash of the above-ground parts of the plants was more alkaline than the roots. As the plants developed the alkalinity of the ash of the aerial parts of the plant decreased and that of the roots increased, until finally the ash of the roots was decidedly more alkaline than that of the aerial organs. This indicates that mineral salts in general increased the proportion of combined acids in the aerial organs of the plant, while in the roots the differences are less noticeable.

Influence of medium on the formation and evolution of perfumes by plants, E. Charabot and A. Hébert (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 26, pp. 1678–1680*).—The results of a study on the effect of different culture media in the production of perfume by plants are reported, in which it is shown that whatever stimulates the transpiration and chlorophyll functions of the plant favors the evolution of perfumes.

Influence of formaldehyde on the growth of white mustard, Bouilhac and Giustiniani (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 19, pp. 1155–1157*).—Experiments were conducted to discover whether one of the higher plants would be able to directly assimilate formaldehyde.

White mustard was grown in flasks placed in a greenhouse in such a way as to receive a very feeble illumination. The object of this was to cut off as much as possible the carbon dioxid assimilation of the plant, and as a possible substitute a few drops of formaldehyde were added to the different flasks. After a few days the plants did not seem to suffer from the poisonous action of the formaldehyde, and under the conditions of the experiment the formaldehyde rapidly disappeared.

After carrying on the experiments for some time and comparing the plants with normally grown specimens, it was concluded that traces of formaldehyde were not injurious to the white mustard, and that that substance could be assimilated by it and serve as a source of carbohydrates where there was an insufficiency of light for the chlorophyll assimilation. In a repetition of the experiment, in which the amount of light was still more reduced, all the plants died, showing that a certain amount of light is necessary for the white mustard to assimilate formaldehyde.

On the nutrition of plants deprived of their cotyledons, G. André (*Compt. Rend. Acad. Sci. Paris, 136 (1903), Nos. 23, pp. 1401–1404; 25, pp. 1571–1573*).—The results of experiments on the nutrition of bean seedlings deprived of their cotyledons are given. An equal number of seedlings were planted under similar conditions, the only difference being that one lot had had their cotyledons removed. After growing for some time the plants were carefully examined and their fresh weight and dry matter determined.

One hundred plants grown under normal conditions increased in weight 129.17 gm., while an equal number of plants without their cotyledons increased only 51.54 gm. The increase in ash, water, etc., is shown. The principal difference was found in the organic matter which was formed by the chlorophyll in the plant, the gain for the plants possessing their cotyledons being more than double any of the others.

The nutrition of tissues in plant galls, C. Houard (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 24, pp. 1489–1491*).—Attention is called to the abnormal condition of the tissues in galls produced by various insects. These tissues are formed by numerous cells which are rich in protoplasm and nutrient material, and they serve to a considerable extent for the nutrition of the parasite. The modifications produced in the fibrovascular bundles to provide for the nutrition of these tissues have been investigated, and in the present paper the author reports upon some of the modifications.

If the parasite is an external one, such as the scale insect or some of the Hemiptera, the fibrovascular bundles are greatly hypertrophied and the phloem is greatly developed in the vicinity of the parasite. If the gall-producing animal lives in the

bark, the cortical cells, which serve for its nutrition, derive their sustenance through the phloem of the annular bundles. In case the parasite lives deep within the tissues there is a decided modification of the wood of the stem and the parasite is brought in contact with the nonlignified portions of the woody tissue cells and with the thin wall cells of the secondary phloem. If the parasite lives within the pith a number of different modifications are produced, all of which are described.

In general, in the galls produced on stems, the nutrition of the abnormal tissues adjacent to the parasite is secured through the fibrovascular bundles, or other small bundles which are specially produced under the stimulating action of the parasite.

Cyanogenesis in plants, W. R. DUNSTAN and T. A. HENRY (*Proc. Roy. Soc. [London], 72 (1903), No. 482, pp. 285-294*).—In this paper, which is the third of a series on the same topic, the authors give an account of phaseolunatin, a cyanogenetic glucosid of *Phaseolus lunatus*. It is stated that the white cultivated beans, commonly known as Lima beans, have never been known to be poisonous, but the colored ones as well as the plant in a semiwild state have frequently exhibited marked poisonous properties.

Previous investigations have been made to determine the presence of hydrocyanic acid in this plant, but it was found not to exist as such but to be probably in the form of a glucosid. In the authors' investigations the beans were powdered and moistened with cold water and in a few minutes the odor of hydrocyanic acid became perceptible. An attempt was made to estimate the amount of hydrocyanic acid produced, as well as to isolate and determine the constitution of the glucosid phaseolunatin. The glucosid proved to be a cyanogenetic one, differing however from the glucosids amygdalin, lotusin, and dhurrin. This glucosid seems to be present throughout the entire life cycle of *Phaseolus lunatus* and associated with it was the enzym required for its hydrolysis.

The constant presence of these substances has led the authors to believe that these glucosids play some definite part in the metabolism of the plants. The reason for the disappearance of cyanogenetic glucosids from the seeds of this bean, as well as from the bitter almond when cultivated, is attributed to the stimulus to the metabolism of the plant resulting from improved nutrition and environment.

Teratological forms of Sterigmatocystis nigra deprived of potassium, M. MOLLIARD and H. COUPIN (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 26, pp. 1695, 1696*).—The effect of depriving this fungus of potassium was studied by means of water cultures in which this substance was omitted. This produced marked morphological changes in the fungus, which were particularly apparent in the conidia. The spores seemed to be formed with great difficulty, while the conidia were very proliferous. The conidia were also smaller and less cuticularized.

A study of a unicellular green alga occurring in polluted water, with special reference to its nitrogenous metabolism, HARRIETTE CHICK (*Proc. Roy. Soc. [London], 71 (1903), No. 475, pp. 458-476, pl. 1*).—A study is reported of a small, unicellular, green alga, which was noticed as frequently present in sewage and sewage materials when these had been kept for some time, particular reference being paid to its nitrogen metabolism. Diluted ammoniacal solutions were found to have become infested with this alga, a fact that seemed of interest in the physiology of the plant.

Pure cultures were prepared and grown in various media. While chlorophyll-bearing plants in general prefer their nitrogen in the form of nitrates, these are found to readily assimilate nitrogen in the form of ammonia and to present the best growth when grown in cultures containing ammonia or various ammoniacal compounds. This feature of the nitrogen assimilation of the plant is believed to be a specialized characteristic developed from the growth of the plant in water, which contained comparatively large amounts of ammonia such as are found in sewage and sewage-polluted water.

The present status of knowledge concerning the root tubercles of leguminosæ and their functions, K. Störmer (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 4, pp. 129–146, figs. 3*).—A critical review is given of some recent publications regarding the nature and functions of root tubercles on leguminous plants.

A contribution to the mycorrhiza problem, L. Hiltner (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), Nos. 1, pp. 9–25; 2, pp. 67–82, pl. 1, figs. 3*).—A contribution is given to the knowledge of the biology and physiology of endotrophic mycorrhiza, such as are found on the roots of a number of forest trees and shrubs, as alders, Eleagnus, Podocarpus, Myrica, various conifers, etc. The roots of these plants are attacked by species of the fungus Frankia, which produce characteristic tubercles or galls. Through these, the author argues, free atmospheric nitrogen is assimilated, as is done in the case of leguminous plants infested with bacteria. The host plant resorbs the rich nitrogenous material secreted by the bacteria in mycorrhiza and in the organisms themselves. The same phenomena are believed to extend to other plants, particularly to gingko and various conifers. The second part of the paper discusses the nutrition of forest trees through mycorrhiza.

A contribution to the mycorrhiza subject, F. W. Neger (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 9, pp. 372–376, fig. 1*).—This article gives an account of experiments in the sterilization of soil by superheated steam, chloroform, and ether, the effect of the treatment being studied on the growth of wheat and mustard.

Mycorrhiza formations on pine trees and high moors, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 7, pp. 284, 285, fig. 1*).—The author calls attention to the claim that mycorrhiza can not be produced in humus soils, and shows figures of roots of *Pinus sylvestris*, in which an abundant production of mycorrhiza is evident.

Form of root tubercles on moor plants, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw. 1 (1903), No. 6, pp. 237, 238, figs. 2*).—A discussion is given of the formation of tubercles on the roots of a number of moor plants, the outgrowth being due to mycorrhiza.

A contribution to the knowledge of the purple melic-grass, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 6, pp. 238–246, figs. 2*).—Studies are reported on the purple melic-grass (*Molinia cærulea*). This grass is quite abundant in certain parts of Europe, growing in sandy regions, and the author describes its method of propagation, the occurrence and significance of mycorrhiza upon its roots, and their possible influence on nitrogen assimilation.

The form and structure of the mycodomatia of Myrica cerifera, J. W. Harshberger (*Proc. Acad. Nat. Sci. Philadelphia, 55 (1903), pt. 2, pp. 352–362, pls. 2*).—The occurrence of coralline tuberculous outgrowths on roots of *Myrica cerifera* is noted, this host plant not having been previously included in a list of the higher plants known to be infested by these outgrowths.

The author reviews the synonomy of the fungi which cause these peculiar developments, and is led to believe that the species in this instance is *Frankia brunchorstii*. A study has been made of the galls and the fungus producing them on the waxberry, and it was found that the mycodomatia grew on the short adventitious roots put out by the stems of waxberry bushes whenever they were covered by sand. On some of the smaller roots the galls were comparatively simple, but later by the increase in the number of the forked fiber-like swellings they became aggregated into clumps the size of a walnut.

A study was made of the fungus in order to determine its relative position, and the writer believes that the genus Frankia should be placed among the Oomycetes, close to Pythium and Peronospora.

ZOOLOGY.

Cusack's glossary of biological terms, W. E. CLARKE (*London: City of London Book Depot, 1903, pp. 165, figs. 251*).—A list of the more common technical terms used in the description and discussion of plant and animal species in laboratory and class-room work. The volume is intended as a guide for students in familiarizing themselves with the meaning of these terms.

First lessons in zoology, V. L. KELLOGG (*New York: Henry Holt & Co., 1903, pp. X+363, pl. 1, figs. 257*).—This volume is intended for the use of pupils in grammar schools and high schools in which laboratory facilities are not provided. It is written to serve as a guide in the personal observations of pupils. The subjects discussed in the volume, include the life history of mosquitoes, silkworms, dragon flies, toads, and certain species of birds, the anatomy of various types of animals, classification, relationship of animals to one another, and notes on the rearing, collection, and distribution of various animal species.

A review of papers on agricultural zoology presented at the Cercle d'Études during the year 1901–2, J. POSKIN (*Bul. Cercle d'Études Agron.* [*Brussels*], *1903, No. 7, pp. 323–334*).—Brief notes on the literature discussed before this body on the subject of economic mammals, birds, batrachians, moths, worms, mites, and insects.

Zoological yearbook for 1902, P. MAYER (*Zool. Jahresber., 1902, pp. VIII+584*).—As in previous years this report contains brief abstracts of the work done during the year in various lines of zoology, in connection with classified bibliographical lists.

Author index to the zoological yearbooks for 1891–1900, E. HENTSCHEL and E. SCHOEBEL (*Autorenregister zu den Zoologischen Jahresberichten für 1891–1900. Berlin: R. Friedländer & Son, 1903, pp. 226*).—A list of all the names of authors whose works have been mentioned in the zoological yearbooks during the period 1891–1900.

International catalogue of scientific literature. L—General Biology (*Internat. Cat. Sci. Lit., 16 (1903), pp. XIII+144*).—This number of the international catalogue is prepared along the lines followed in previous numbers, and includes literature relating to general biology, methods and apparatus, general morphology, physiology, and cytology.

Animals useful to agriculture, C. LANDES (*Jour. Agr. Prat.* [*Toulouse*], *99 (1903), No. 3, pp. 142–171*).—Notes are given on the economic relations of birds, with special mention of the feeding habits of a number of species, and on insectivorous mammals, reptiles, batrachians, and beneficial insects.

Catalogue of Canadian birds, II, J. MACOUN (*Ottawa: Geol. Survey of Canada, 1903, pp. 219–413*).—This part of the author's catalogue of Canadian birds includes a discussion of the distribution and habits of birds of prey, woodpeckers, flycatchers, crows, jays, and blackbirds.

The economic value of birds to the State, F. M. CHAPMAN (*Albany: New York State Forest, Fish and Game Com., 1903, pp. 66, pls. 12*).—The author discusses the economic relation of birds to forests, fruits, and field crops. A brief discussion is given of the laws which have been passed for the protection of birds and of modifications which should be made in these laws.

Brief mention is made of the methods ordinarily employed in studying the food of birds, and statistics are given on the feeding habits of various water birds, grouse, doves, hawks, owls, cuckoos, woodpeckers, flycatchers, crows, jays, blackbirds, robins, sparrows, swallows, etc. A number of species are illustrated in colors by L. A. Fuertes, and a brief bibliography of articles relating to the food of American birds is also given.

The economic value of our native birds, H. A. SURFACE (*Pennsylvania State Dept. Agr., Zool. Quart. Bul. 1 (1903), No. 2, pp. 16, fig. 1*).—An analytical key is

given for the determination of families of Pennsylvania birds, together with brief notes on the economic importance of these families.

Birds in relation to agriculture, GUNNING (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 1–3, pls. 5*).—The feeding habits of vultures, falcons, hawks, buzzards, and eagles are described with reference to the economic relations of these birds to agriculture. All of the species are believed to do more good than harm, under ordinary conditions.

The bird as the laborer of man, W. T. L. TRAVERS (*Trans. and Proc. New Zealand Inst., 35 (1902), pp. 1–11*).—Attention is directed to the agency of birds in controlling the ravages of insect pests, and a number of specific instances are noted in which birds are shown to have been of economic importance in the control of these pests.

Observations on birds, S. P. JAMES (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1902, No. 2, pp. 99–106*).—Experiments were made in allowing species of Anopheles and Culex to feed on birds infected with proteosoma and halteridium. Sparrows and pigeons were used in these experiments. It was found that sparrows were susceptible to both forms of parasites, while pigeons became infected only with halteridium. Both Culex and Anopheles were found to feed readily on sparrows and pigeons when confined in cages with mosquito netting upon the walls. No change in temperature was observed in these birds after infection with the malaria parasites, but the normal temperature of a sparrow was found to be 106 to 107.5° F., and of a pigeon 107 to 108° F.

Our smallest birds and their habits, W. WHYTE (*Trans. and Proc. Perthshire Soc. Nat. Sci., 3 (1902–3), No. 5, pp. 238–245*).—Notes are given on the feeding habits and economic relations of the goldcrest, firecrest, blue tit, coal tit, long-tailed tit, and common wren.

Annual report of the Ornithological Society of Munich for 1901–2, C. PARROT (*Jahresber. Ornithol. Ver. München, 3 (1902), pp. 392, pl. 1*).—In this report notes are given on the proceedings of the various meetings of the society, and a number of papers which were read are reproduced. These cover a variety of subjects and are largely concerned with the habits and biological relations of a number of birds, including *Phylloscopus bonellii, Ortygometra porzana, Clavicola riparia,* etc.

The duck hawk (Falco peregrinus anatum) in Iowa, B. H. BAILEY (*Proc. Iowa Acad. Sci. 1902, pp. 93–98*).—Notes are given on the feeding habits and biology of this bird.

A rabbit drive in Riverina, New South Wales, DAISY M. BATES (*Jour. Dept. Agr. West. Australia, 7 (1903), No. 2, pp. 111–115*).—A description of a rabbit drive undertaken for the purpose of reducing as far as possible the injury from the excessive number of rabbits. During this drive about 4,000 rabbits were secured.

Soil and topographical influence upon the color and size of the European mole, V. P. VRADI (*Selsk. Khoz. i Lyesov., 211 (1903), Oct., pp. 175–183*).—Notes are given on dark and light forms, and in general upon the distribution of color forms of the European moles in various regions. The occurrence of certain color forms in different months of the year is shown in tabular form.

The destruction of rats on ships as a means of preventing the introduction of plague, NOCHT and G. GIEMSA (*Arb. K. Gesundheitsamte, 20 (1903), No. 1, pp. 91–113, figs. 9*).—According to the extensive investigations reported by these authors the safest and most practical method of destroying rats on shipboard consists in the production and proper distribution of carbon monoxid. This gas can be easily and economically produced, and detailed notes are given on suitable apparatus for producing it. The gas is extremely poisonous to rats and is perfectly harmless to the most delicate fabric.

The monthly bulletin of the division of zoology, H. A. SURFACE (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 1 (1903), No. 7, pp. 32, pl. 1*).—Brief notes

are given on insect remedies for November, treatment for San José scale, destruction of rats, protection of birds, notes on game laws, etc.

Game laws for 1903, T. S. Palmer, H. Oldys, and R. W. Williams, Jr. (*U. S. Dept. Agr., Farmers' Bul. 180, pp. 56, figs. 5*).—This is a revised and condensed form of Bulletin 16 of the Division of Biological Survey (E. S. R., 13, p. 532). The special purpose is to present in a brief form information regarding the game laws and requirements concerning the shipment and sale of game.

METEOROLOGY—CLIMATOLOGY.

Monthly Weather Review (*Mo. Weather Rev., 31 (1903), Nos. 7, pp. 309–364, figs. 12, charts 9; 8, pp. 365–406, figs. 8, charts 10; 9, pp. 407–448, charts 10*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of July, August, and September, 1903, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 7.—Special contributions on Note upon Economical Shapes for Cutting Envelopes of Balloons (illus.), by C. F. Marvin; Benjamin Thompson—Count Rumford (illus.), by D. T. Pierce, jr.; On Curves Representing the Paths of Air in a Special Type of Traveling Storm (illus.), by W. N. Shaw; The Meteorological Work of the Expedition to the Bahamas, by O. L. Fassig; and Observations of Solar Radiation with the Angstrom Pyrheliometer at Asheville and Black Mountain, N. C. (illus.), by H. H. Kimball; and notes on the "guns" of Lake Seneca, N. Y.; variation of gravity over the deep sea; Weather Bureau men as instructors; the droughts of 1901–1903; the rain maker in Australia; meteorology in the universities; the movements of the air within areas of high and low pressure; and meteorology in the summer schools.

No. 8.—Special contributions on The Periodicity of Sun Spots and the Variations of the Mean Annual Temperatures of the Atmosphere, by C. Nordmann; On the Simultaneous Variations of Sun Spots and of Terrestrial Atmospheric Temperatures, by A. Angot; The Hurricane of August 11, 1903, at Jamaica, by H. H. Cousins; and Soil Temperatures and Vegetation (illus.), by D. T. MacDougal (see p. 563); and notes on Weather Bureau men as instructors; the method adopted in constructing normals; [meteorological observations on a trip] from New York to Cape Town; the temperature of the upper air as observed on mountains and with kite meteorographs; hurricane at Martinique, August, 1903 (illus.); the resignation of H. Sowerby Wallis; retirement of Professor [George von] Neumayer; local storm in Baltimore, Md.; and notes upon economical shapes for cutting envelopes of balloons.

No. 9.—Special contributions on Weather Bureau Cooperation in Reclamation Work, by F. H. Brandenburg; Hurricane in the Gulf of Mexico, by J. Elligers, jr.; Methods of Meteorological Investigation, by W. N. Shaw (E. S. R., 15, p. 341); and The Hurricane Season, by E. del Monte; and notes on fiftieth anniversary of the Meteorological Society of France; meteorology at Williams College, Massachusetts; a seven-year cycle in rainfall in Illinois; Weather Bureau men as instructors; the new Weather Bureau station in Yellowstone Park, Wyo.; sun spots and weather; small lightning discharges between the raindrops; old weather record at Fairmount, Onondaga County, N. Y.; and hurricane on September 11 in the Bahamas.

Report of the meteorologist, W. H. Bishop (*Delaware Sta. Rpt. 1902, pp. 152–158*).—Monthly summaries of observations at 3 places in Delaware on temperature, pressure, precipitation, relative humidity, and prevailing winds during the year ended June 30, 1902, are given, with a summary of observations on temperature and precipitation during the calendar year 1901. The summary for 1901 is as follows:

Annual summary of meteorological observations in Delaware, 1901.

Place of observation.	Temperature. Highest.	Lowest.	Mean.	Total rainfall.	Number of days on which 0.01 in. or more of rain fell.
	Deg. F.	*Deg. F.*	*Deg. F.*	*Inches.*	
Newark	(July 2) 100	(December 22) 6	51.1	44.62	84
Dover	(July 1) 103	(January 20) 9	53.3	46.75	75
Seaford	(July 1) 102	(December 22) 9	53.8	36.73	84

Meteorological summary for 1901, C. A. PATTON (*Ohio Sta. Bul. 135, pp. 103–115*).—This summary includes notes on the weather and tabulated daily and monthly records of observations at the station at Wooster, Ohio, on temperature, precipitation, cloudiness, direction of the wind, etc., and for comparison, similar data for previous years and for other parts of the State. The following is a summary of results:

Summary of meteorological observations in Ohio.

	For the experiment station. 1901.	1888–1901.	For the State. 1901.	1888–1901.
Temperature (°F.):				
Mean	48.7	49.2	50.2	50.8
Highest	(July 1, 22, 28, and 29) 95.0	(Aug. 8, 1891) 99.0	(July 22) 109.0	(July 4, 1897) 113.0
Lowest	(Dec. 21) −11.0	(Feb. 10, 1899) 21.0	(Feb. 23) −20.0	(Feb. 10, 1899) −39.0
Mean daily range	20.1	20.05		
Greatest daily range	(Apr. 30) 43.0	(Oct. 6, 1895) 55.0	(Dec. 14) 61.0	(Sept. 28, 1897) 67.0
Clear days	152.0	125.0		
Cloudy days	147.0	121.0		
Days rain fell	142.0	127.0		
Rain fall (in.):				
Greatest monthly	(Sept.) 5.64	(July, 1896) 8.05		
Least monthly	(Oct.) .81	(Sept., 1897) .29		
Mean yearly			32.98	37.51
Prevailing direction of wind	SW.	SW.	SW.	SW.

Meterological observations obtained by the use of kites off the west coast of Scotland, 1902, W. N. SHAW and W. H. DINES (*Proc. Roy. Soc.* [*London*], *72* (*1903*), *No. 477, pp. 13–15*).—A summary is given of the results of observations on humidity and temperature made by means of 40 kite ascents during July and August, 1902, 2 from a small island in Crinan Bay, Argyllshire, the rest from the deck of a small tug steaming in Jura Sound or neighboring sea.

"Kites were raised on 71 occasions, but on 31 of them the force of the wind, even when assisted by the speed of the tug at 7 knots, was not sufficient to raise the recording instruments. On those occasions an experimental form of registering air thermometer alone was carried. The average recorded height of ascents with instruments was 5,900 ft. (1,940 meters), and average computed height of the 71 ascents 4,200 ft. (1,400 meters); a height of 12,000 ft. (3,700 meters) was passed on two occasions, and 15,000 ft. (4,500 meters) was reached once, but the record was lost owing to the

breaking away of the highest kite." The fall of temperature for each 500 meters of ascent was as follows:

Fall of temperature in degrees centigrade for each 500 meters of ascent.

Height.	July.		August.	
	Ascents.		Ascents.	
Meters.		*Degrees C.*		*Degrees C.*
0 to 500	22	3.0	13	2.6
500 to 1,000	16	2.8	11	2.8
1,000 to 1,500	9	2.2	9	2.3
1,500 to 2,000	2	2.0	7	2.1
2,000 to 2,500	1	2.0	3	2.0
2,500 to 3,000	....	....	2	2.0
3,000 to 3,500	....	....	2	1.7

"The range of fall for the first 500 meters varied from 4 to 1° C. The smallest fall was associated with an inversion of temperature gradient not far from the surface. An inversion of temperature gradient with very dry air above a layer of clouds was shown also on one of the occasions of steepest gradient near the surface. The steep gradients observed in the lower strata are shown to be associated with anticyclonic conditions preceding the approach of a depression, and by examples of five occasions it is shown that the characteristic of the passage of a depression is that the isothermal lines of the diagram open out as the depression comes on, the average diminution of gradient for the change of barometic condition amounting to as much as 50 per cent." The average Crinan temperature gradient was almost identical with that given by Hann, "and with the conventional correction in use in this country for the reduction of temperature to a common level, viz, 1° F. per 300 ft."

As regards the differences between the temperatures as observed in the free air at the same height as the summit of Ben Nevis and those recorded on the mountain itself, it was noted that "the differences are always in favor of the free air, which is shown to be on the average 2.6° warmer than the mountain summit."

Meteorology, J. L. SOUTTER ET AL. (*Transvaal Agr. Jour., 1 (1903), No. 2, pp. 55, 56*).—Monthly summaries are given of observations on rainfall and shade maximum and minimum temperatures (for Sept.–Nov.) at Pretoria and Johannesburg during 1902, and on rainfall at Vereeniging during the year ended November 30, 1902. The average monthly rainfall at Pretoria for the 10 years ended June 30, 1902, is also reported. The average yearly rainfall at Pretoria during 10 years was 26.91 in.; the rainy days 89, occurring mainly from November to March, inclusive.

Meteorology of New Zealand (*Trans. and Proc. New Zealand Inst., 35 (1902), pp. 579–597.*)—This contains a comparative summary of observations on pressure, temperature, rainfall, wind movement, etc., for 1902 and 38 previous years at Aukland, Wellington, and Dunedin; the average spring, summer, autumn, and winter temperatures of 1901 and 1902 at these three places; brief remarks on the weather of each month of 1902; a record of earthquakes reported during the year; and records of Milne seismographs at Wellington and Christchurch during 1902.

Organization of observations on agricultural meteorology at experiment stations, B. B. VINER (*Trudi Syez. Dyeyat. Selsk. Khoz. Opuitn. Dyela.; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 4, pp. 509, 510*).

Climate of the Argentine Republic, W. G. DAVIS (*Buenos Ayres: Min. Agr., 1902, pp. 154, charts 26*).—The text of the present work, which is printed in Spanish and English in parallel columns, "is essentially a reproduction of the chapter on climate which appeared in the first volume of the Second Census of the Argentine Republic (May 10, 1895), published in 1898, but the tabular values have been modified to correspond to the five years' observations made since the original article was written. . . . The mean values, deduced from long series of observations made

prior to 1896, have been but slightly modified by the additional five years' results, the greater scope of the present volume being due to the more extended period of observations and the increase in the number of stations."

The characteristic peculiarities of climate which prevail in the northern, central, and southern sections of the littoral, Mediterranean, and Andine divisions of the Republic, whose climatic differences depend principally on their latitudinal situation and elevation, are discussed and detailed data are given relating to temperature of the air and soil, pressure, humidity of the air, evaporation, sunshine and clouds, rainfall (including rain, snow, hail, and thunderstorms), and wind. The principal climatic features are charted.

As would be expected of a region covering 33 degrees of latitude and a wide range of altitude, there are great differences of climatic conditions in Argentine Republic. Starting with a mean temperature of 23° C. on the eastern border of the intertropical district (north of the Tropic of Capricorn), the mean temperature drops to less than 14° on the western border, the rainfall declining from 1,600 to 50 mm. In latitude 30 to 31°, 8 to 9° farther south, the eastern pampas region has a mean temperature of 19° C., which rapidly falls as the slopes of the Cordilleras are ascended. At the same time the rainfall declines from 1,000–1,200 to less than 100 mm. Ten degrees farther south there is little change from east to west, the mean temperature being 13 to 14° C., the rainfall 200 to 400 mm. At the extreme south, in latitude 55°, the climate is rigorous. In Tierra del Fuego the mean summer temperature is 8 to 9° C., the winter temperature 2 to 3°. Snow occurs during every month of the year and rains are frequent. The mean annual precipitation of Staten Island is 1,400 mm., although less than half as much falls in Tierra del Fuego.

Agricultural climatology, Grégoire and Vandervaeren (*Bul. Cercle Études Agron. [Brussels], 1903, No. 8, pp. 355–359*).—A plan for concerted observations on this subject in Belgium is outlined.

Rainfall observations in Australia from 1881 to 1900, V. Raulin (*Ann. Soc. Météor. France, 51 (1903), pp. 121–134*).

A cheap and simple rain gauge, S. F. Lundstrom (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 2, pp. 134, 135*).

The daily and yearly periods of storms and hail in Steiermark, Kärnten, and Oberkrain, J. Hann (*Meteor. Ztschr. [Vienna], 20 (1903), pp. 426–428*).

The harmonic analysis of the diurnal movement of the air over Hamburg, J. Schneider (*Meteor. Ztschr. [Vienna], 20 (1903), pp. 385–398*).

Height of the atmosphere determined from the time of disappearance of blue color of the sky after sunset, T. J. J. See (*Nature [London], 68 (1903), No. 1770, p. 526*).

WATER—SOILS.

The industrial uses of water, H. de la Coux, trans. and rev. by A. Morris (*New York: D. Van Nostrand Co., 1903, rev., pp. 364*).—Treats of the composition, effects, and defects of water from an industrial standpoint—for use in boilers, dye, print, and bleach works; in textile industries; soap works, laundries, tanning, paper-making; photography; sugar-refining; making ices and beverages; cider making; brewing; and distilling. Methods of purifying waters and correcting their defects are described.

Soil temperatures and vegetation, D. T. MacDougal (*Mo. Weather Rev., 31 (1903), No. 8, pp. 375–379, figs. 7*).—This is an account of experiments with an automatic apparatus for determining soil temperatures, described in a previous number of the Record (E. S. R., 14, p. 125). The installation of the apparatus in the grounds of the New York Botanical Gardens is described, and records obtained with it during 14 months are discussed.

The records show that "the maximum daily temperatures occurred between 8 and 11 p. m., and the minimum 12 hours later, or between 8 and 10 a. m. The optimum temperature for absorption by roots lies well above that of the soil at the depth at which the observations were made. It follows, therefore, that the temperature of the soil approaches this optimum most nearly, and offers most favorable conditions for the taking up of watery solutions at a time of the day when the amount of water thrown off by the shoot and of mineral matter used in metabolism are nearing the minimum by reason of the absence of light, lowered air temperature, and consequent increased humidity of the air." The influence of these inharmonious conditions in causing guttation excretions from plants is explained. The greatest variation in temperature recorded during 24 hours was 2° C. (3.6° F.) on June 28 and July 16. The maximum temperature recorded was 13.2° C. (56° F.) in July, and the minimum −3° C. (26.6° F.) in December, giving a total annual variation of 16.2° C. (29.4° F.). "Both the maxima and minima are higher in January than in December and are still higher in February, at which time the temperature of the air reaches its annual minimum. As a consequence of the above conditions the roots of plants at a depth of a foot (30 centimeters) in this locality find increasingly more favorable conditions for activity after the latter part of December. . . . The approach of the spring season in this locality therefore finds the root systems and absorbing organs of the vegetation which penetrates the soil to the given depth in a state of comparatively great activity, and it needs but the exposure of a few days or even of a few hours in some plants to allow for very marked development of the stems, leaves, and flowers."

A notable difference in temperature of the aerial and subterranean portions of plants was observed, and the influence of this condition on the transport of fluids and solutions from one part of the plant to another is explained.

Investigations on the influence of the volume of the soil on the yield and composition of plants, O. Lemmermann (*Jour. Landw., 51 (1903), No. 3. pp. 279–285*).—The results here reported confirm those of previous experiments (E. S. R., 14, p. 1056) in showing a decided relation between the yield and the volume of the soil in which the crop is grown. The experiments here reported were made in 2 series of pots, in one of which each pot contained 30 and in the other 15 kg. of soil. All of the pots except those used as checks were supplied with a sufficient amount of the necessary fertilizing constituents.

The author concludes that the larger yield with the larger pots and the smaller yield from the smaller pots had no relation to the supply of plant food, but depended entirely upon the space which was available for the root development of the individual plants.

On the lime requirements of soils, and its determination, Immendorff (*Oesterr. Chem. Ztg., 6 (1903), No. 18, p. 412*).—This is a brief note on an address before the International Congress of Applied Chemistry at Berlin in 1903. The calcium compounds which are considered of importance in relation to plant nutrition are calcium carbonate, calcium combined with humus acids, zeolitic lime compounds, and calcium silicate. As regards their lime requirements, the author classifies soils as follows: (1) Acid soils, prominent among which is sour moor soil, and in which the author recommends that humus acid be determined by means of Tacke's method; (2) neutral soils tested by means of boiling with sulphuric acid and titration; and (3) alkali soils, which almost always contain calcium carbonate, which may be detected by means of hydrochloric acid. In the author's opinion soils should not contain less than 0.25 per cent of soluble calcium salts. In case of alkali soils the physical properties must also be taken into consideration.

The importance of calcium and magnesium salts in the nutrition of plants, Gössel (*Chem. Ztg., 27 (1903), No. 78, p. 952*).—A brief account is given of experiments with water cultures and soils to test the accuracy of Loew's hypothesis regard-

ing the necessity of maintaining a certain ratio between calcium and magnesium compounds in the soil. The results indicate that plants grow well in media containing more magnesium salts than lime salts. The highest yields were obtained in water culture with 0.4 part of lime (CaO) to 1 part of magnesia (MgO) and hence the results did not bear out Loew's hypothesis.

Fertility of soil according to the most recent data, S. BOGDANOV (*Selsk. Khoz. i Lyesov., 210 (1903), Sept., pp. 628–667*).—The author attempts a systematic discussion of the question of the fertility of the soil, giving a summary of his previous articles on the subject (E. S. R., 12, p. 725) and supplementing it with results obtained by other investigators. He gives especial attention to the sulphur requirements of plants, which he believes have heretofore been underrated, and reports experiments made in 1898 and 1899 with special sulphate fertilizers in comparison with other more common fertilizing materials on white mustard grown in pots of clayey chernozem. The application of sulphuric acid in form of sodium sulphate greatly increased the yield in both years.—P. FIREMAN.

The green sandstone soils of Lower Bavaria and the Oberpfalz, PUCHNER (*Vrtljschr. Bayer. Landw. Rath., 8 (1903), No. 3, pp. 530–533*).—Physical and chemical examinations of several of these typical soils are briefly reported. The results show that the soils are as a rule light and have only medium retentive power for moisture. They need phosphoric acid most of all, occasionally potash, and usually nitrogen.

Some investigations on the physical properties of soils, W. BAGGER (*Ugeskr. Landm., 48 (1903), Nos. 12, pp. 133–135; 13, pp. 152, 153*).

Mechanical and physico-chemical analyses of the soils of the provinces of Forli and Cesena, Italy (*Ann. R. Staz. Agr. Forli (1902), No. 31, pp. 65–74*).

A new theory of the soil, A. D. HALL (*Nature [London], 69 (1903), No. 1777, pp. 58, 59*).—A critical review of Bulletin 22 of the Bureau of Soils of this Department (E. S. R., 15, p. 457).

On the origin, properties, and applicability of Swedish moor soils, R. TOLF (*Svensk. Mosskult. Tidskr., 17 (1903), No. 4, App., pp. 32*).

Worn-out farms, W. M. MUNSON (*Maine [Univ.] Bul., 6 (1903), No. 2, pp. 9–24*).—A general discussion of the causes of soil exhaustion and of practical means for the restoration of worn-out lands.

Studies in soil bacteriology, F. D. CHESTER (*Delaware Sta. Rpt. 1902, pp. 46–78, figs. 6*).—Studies are reported on the variation in the number of bacteria in soils, the effect of stirring and pulverizing soil on its bacterial content, the effect of mineral fertilizers on the development of soil bacteria, the predominating bacteria in a soil sample, and on the nitrogen-assimilating bacteria of soils.

In the previous report (E. S. R., 14, p. 232) the author showed the wide variation in the number of bacteria in soils of adjacent plats bearing different cover crops. The variation within narrow horizontal limits was investigated, samples being taken at intervals of 12 in. and the number of bacteria per gram of dry soil determined. The determinations, which are given in tables, show that within a range of 5 ft. the number of bacteria in the soil do not vary greatly. In order to test further the limit of variation, plats were planted with peas and vetches and at intervals of 10 ft. soil samples were removed for examination, the sample being taken to a depth of 8 in. The determinations made in these experiments indicated that a fairly reliable average of the number of bacteria in the soil of the field can be obtained by taking samples at intervals of 10 to 20 ft. and thoroughly mixing them.

The effect of stirring and pulverizing soil on its bacterial content was investigated to see what relation tillage would bear to the development of soil bacteria. Samples of soil were collected and thoroughly mixed, all lumps being reduced to uniform size. This mixing and pulverizing was assumed to be equivalent to thorough tillage. The bacterial content of the soil was determined immediately after filling the pots and at

intervals of a week to 10 days. It was found that stirring and pulverizing the soil stimulated the development of soil bacteria. The number per gram of dry soil increased from 2,000,000 to 12,600,000 in 24 days.

The effect of mineral fertilizers on the development of soil bacteria was investigated, the experiments being conducted in galvanized-iron pots. The soil samples were placed in the pots and a complete fertilizer composed of sodium nitrate, potassium chlorid, and sodium phosphate was added to each. Bacterial analyses of the soil in the pots were made at intervals and the results showed that even the liberal use of mineral salts, which act as great stimulators to plant growth, were without appreciable effect on the bacterial development.

A study was made of the predominating bacteria in a soil sample, which was examined by methods of dilution and culture. It was found that 3 species of bacteria predominated. The first, which is designated as "Bacterium A" and to which the author has given the name *Streptothrix soli* n. sp., was represented by 1,600,000 per gm. of dry soil; the second, *Bacterium flocosum* n. sp., 1,200,000; and *Bacillus delavariensis*, 300,000. These different organisms are described in considerable detail and their relationship pointed out.

Studies are reported on the nitrogen-assimilating bacteria of soils, the author reviewing the investigations of Berthelot, Winogradsky, Beijerinck, and others. A preliminary report is given of his own studies of oligonitrophilous bacteria, which were isolated from Delaware soil. Three organisms, designated as *Azotobacter I*, *Pseudomonas I*, and *Bacillus I*, were studied. At the end of 28 days the first species had shown no gain of nitrogen in its culture, seeming to indicate that this organism when growing alone in pure cultures in nitrogen-free media is without the power of utilizing free atmospheric nitrogen. The other 2 organisms showed a decided increase in the amount of nitrogen, the gain in the case of the Pseudomonas species being 4.3 times the original content, while for the Bacillus the gain was 3.4 times the original content. The characters of these organisms are briefly described.

The activity of bacteria in soils, F. MUTH (*Verhandl. Naturw. Ver. Karlsruhe, 16 (1902-3), pp. 69-124, figs. 20*).—A summary of information on this subject.

FERTILIZERS.

Cover crops as green manure, C. L. PENNY (*Delaware Sta. Bul. 60, pp. 44, figs. 2.*)—This is a discussion of this subject based on yields and analyses of crops grown on the station plats in a series of experiments begun 2 years ago in cooperation with this Department. In connection with the report of the results of this investigation the author summarizes "the generally accepted views of the present day on plant nutrition in so far as it relates to the use of cover crops," incorporating much of the data which have been reported in previous bulletins of the station.

The tabular data reported include the weights per acre of the portion above ground of each crop in the state in which it was harvested, with the percentage content of nitrogen, potash, and phosphoric acid, and the weight per acre of each of these constituents; the air-dry weight per acre of the roots of several crops, in some cases in 2 layers, the first 8 in. and the next 4 in., with the percentage composition; the weight per acre and the percentage of the portion above ground and of the roots separately, both on the air-dry basis, and the weight per acre of the 3 chief constituents; for comparison a money valuation of each crop, the nitrogen being rated at 12 cts. a pound, the potash at 5 cts., and the phosphoric acid at 3 cts.; the relative yield of dry matter, nitrogen, potash, and phosphoric acid found in the tops and the roots, stated as a percentage of these respective constituents found in the whole crop; the moisture content of the surface soils used to grow the cover crops, both plowed and unplowed; and the moisture content of the corresponding subsoils.

The 8 crops giving the highest money valuation for the nitrogen, potash, and phosphoric acid produced per acre were as follows: Rye and vetch \$25.84, rape \$24.99, crimson clover \$22.37, cow horn turnips \$21.01, soy beans \$20.44, rye and

vetch $19.68, vetch $19.64, and red clover $17.90. Three of these crops contained a considerable proportion of their fertilizing value in the roots, viz, "the cow horn turnip 42 per cent, the alfalfa 40 per cent, and the red clover 30 per cent. None of the remaining 5, the soy bean, the cowpea, the vetch, the rape, and the crimson clover, had more than 10 per cent of the total value in the roots. Of the 'nitrogen gatherers' the alfalfa showed the highest relative value in the roots, while the red clover was but a trifle lower. On the contrary the crimson clover had, at least in this experiment, the lowest relative value in its roots, viz, 5 per cent. The preponderance in most cases was due chiefly to the greater weight of the tops, but due also in a less degree to the higher percentage of nitrogen and potash usually found in the tops. The potash was invariably richer in the tops, sometimes nearly threefold richer; the nitrogen was likewise richer with but one exception, the red clover. The phosphoric acid was nearly equally distributed, sometimes richer in the tops and sometimes in the roots. The relative amount of dry matter in the tops and roots, at least in the case of crimson clover, was variable both with the particular field of clover and with the stage of growth; the percentage composition was likewise subject to considerable fluctuation."

It is the author's opinion in view of these facts that the relative fertilizing value of the roots of plants is often overrated. "In many cases, at least, it is small, sometimes quite insignificant." The crops as a whole showed an average of only 4 per cent of the total roots below a depth of 8 in. The value of the phosphoric acid furnished by the crops was comparatively insignificant, the most important element being the nitrogen. The highest potash value, $8.07 per acre, was found in rape, being 32 per cent of the total value. The cow horn turnip furnished $7.14 worth of potash and the rye and vetch $6.76 worth, this being in each case about 34 per cent of the total value. The changes which the organic matter of green manures undergo in the soil by which they are rendered available as plant food are discussed in detail, and the great benefit due to improvement in physical condition by the use of such manures is explained.

On the management and effect of barnyard manure, Schneidewind (*Oesterr. Chem. Ztg., 6 (1903), No. 18, p. 412*).—This is a brief note on an address before the International Congress of Applied Chemistry at Berlin in 1903, calling attention to the fact that the most effective manure is made up of the fresh liquid portion combined with the decomposed solid portion and litter. Such manure may be obtained by the separate storage of the solid and liquid manure, but this method is as a rule impracticable. The use of sulphuric acid effectually prevents loss of nitrogen, but it also interferes with the proper decomposition of the manure. All preservative material, such as lime, gypsum, copper sulphate, etc., as well as the various acid salt preparations which are found in the market, are useless. Peat and earth are the most serviceable preservatives that can be used.

Nitrate of soda containing perchlorate and its effects on plant growth, H. Pellet and G. Fribourg (*Ann. Sci. Agron., 2. ser., 1902–3, II, No. 2, pp. 199–225, fig. 1*).—In this paper, which was presented to the International Congress of Applied Chemistry at Berlin in 1903, the authors give results of investigations by themselves and others on this subject, especial attention being given to methods of chemical examination of nitrate of soda containing perchlorates.

It is shown that commercial nitrate of soda may contain considerable amounts of perchlorates, the proportion varying from traces to 1.5 per cent. In some samples the amount present runs as high as 3.2 per cent to 6 per cent of perchlorates calculated as potassium perchlorate. The injurious effects which have frequently been observed as a result of applications of nitrate of soda have generally been attributed to potassium perchlorate. The investigations of de Caluwe, however, have demonstrated that sodium perchlorate in the proportion of 1 per cent is also injurious to vegetation and that potassium perchlorate and chlorate are much less injurious than sodium perchlorate.

The authors show that it is comparatively easy to determine the perchlorates and associated chlorates in commercial nitrate of soda. It is necessary simply to determine (1) the chlorin in the original sample and (2) the total chlorin in the calcined nitrate. The difference corresponds to the chlorin in the form of chlorates and perchlorates. By treatment of the solution left after the determination of chlorin in the original sample with lead nitrite the chlorin corresponding to chlorates is obtained. Nitrate of soda containing perchlorates as a rule contains little chlorate. Commercial nitrate always contains a certain amount of potash. It is recommended, therefore, that a complete analysis of nitrate of soda shall include determinations of chlorates, perchlorates, and potash, the chlorates and perchlorates, however, being calculated as sodium salts.

The utilization of the nitrogen of the air, A. Wiesler (*Oesterr. Chem. Ztg.*, 6 (*1903*), *No. 19, pp. 434, 435*).—This article discusses the fixation of free nitrogen by means of calcium carbide.

Fertilizer experiments with carbide nitrogen (calcium cyanamid), P. Bolin (*Landtmannen*, *14* (*1903*), *No. 39, pp. 609–611*).—The experiments were conducted on a clay soil, barley and oats being grown on the plats. The effect of the fertilizer was found to be 60 to 70 per cent of that of nitrate of soda, according to the quantities applied which varied from 150 to 225 kg. per hectare (134 to 301 lbs. per acre).—F. W. WOLL.

Experiments on methods of applying fertilizers (*Verslag. Proefstat. Suikerriet, West Java, 1903, pp. 108–111*).—Forty-four samples from a soil top-dressed with nitrate of soda and sulphate of ammonia, tested 10, 25, and 40 days after the application, showed that the distribution of the nitrogen in the soil from this source was mainly confined to a surface layer 5 cm. in depth. Where sulphate of ammonia had been applied in small depressions made into the soil, the distribution of this substance in a horizontal direction 10 days after the application varied from 6 to 9 cm. These samples showed only traces of nitrate nitrogen in the surface layer of the soil, but samples taken 15 days later plainly showed its presence. The lower layers of the soil showed neither ammonia nor nitrates and not until 40 days after the application and after a rain of 100 mm. was nitrate detected 30 cc. below the surface.

Culture trials with a fertilizer manufactured from beet-molasses refuse, H. G. Söderbaum (*K. Landt. Akad. Handl. och Tidskr.*, *42* (*1903*), *No. 2, pp. 85–94*).—The fertilizer experimented with was manufactured by the Wenck process, in which the refuse from the beet molasses, after this has been used for the manufacture of sugar or alcohol, is mixed with calcium carbonate and dried. During the drying a definite quantity of sulphuric acid is added. The resulting product forms a solid, pulverizable mass containing 10 to 12 per cent of potash, 3 to 4 per cent of nitrogen (largely in organic form), and about 0.1 per cent of phosphoric acid.

Experiments with the fertilizer were conducted in glass or zinc cylinders of 0.3 square meter surface, filled with sandy soil. The fertilizer was applied to barley oats, potatoes, and sugar beets, being compared in different trials with sulphate of potash, kainit, 37 per cent potash salt, or nitrate of soda. The yields of barley with the molasses fertilizer were similar to those obtained with sulphate of potash, whether much or little potash was added, the maximum returns being obtained with applications of 200 kg. per hectare (189 lbs. per acre) of potash in the form of sulphate of potash and of 300 kg. of molasses-fertilizer potash.

In the oat experiments, in which the molasses fertilizer was compared with nitrate of soda, the former gave a decided increase in yield over that obtained in the cylinders which did not receive any fertilizer, but the increase was only about half as large, on the average, as that obtained in the nitrate of soda cylinders, and the effect was somewhat more pronounced in the yield of grain than in that of straw. In the potato experiments the molasses fertilizer gave somewhat better results than corresponding quantities of kainit, without depressing the starch content of the potatoes.

The fertilizer is, in general, to be considered primarily a potash fertilizer, and its potash is of about the same value as that of sulphate or kainit. The cost at which it can be manufactured will determine the extent to which it can be used economically.—F. W. WOLL.

Report of cooperative fertilizer experiments in Sweden for 1902, P. Bolin (*K. Landt. Akad. Handl. och Tidskr., 1903, App., pp. 133, charts 2*).—The experiments were conducted in different parts of Sweden by the author under the auspices of county agricultural societies. Two hundred and forty-six experiments, including 6,497 trial plats, were arranged for in all, in 16 different counties. Of these experiments 174 were with spring grains, 47 with root crops, and 25 with pasture. The following fertilizers were applied: Nitrate of soda, poudrette, superphosphate, Viborgh phosphate, Thomas phosphate, steamed bone meal, 37 per cent potash salt, and kainit.

In the discussions of the results obtained, the author calls attention to the fact that an abundant fertilization with nitrogenous fertilizers may in a season of much precipitation, like that of 1902, have a deleterious influence on the yield of crops by developing the vegetative growth of the plants at the expense of seed formation and ripening. An abundant nitrogenous fertilization retards the ripening of the grain, and in seasons when the spring work has been delayed and there is therefore danger of late ripening, a relatively smaller use of nitrate is to be recommended than in the case of early sowing, and late-ripening varieties can stand less nitrogen fertilization than earlier varieties. On the whole, a smaller effect from nitrogenous fertilizers was noted on soils rich in humus than on those low in humus, but even in the case of the former the increased yields obtained were sufficient to pay for the fertilizers used with small grains, 100 to 200 kg. per hectare (90 to 180 lbs. per acre) proving an economical fertilization, whether the nitrate was applied alone or in conjunction with other mineral fertilizers.

The results obtained in the experiments with meadows indicate that nitrate of soda and other nitrogenous fertilizers give best returns on land where the true grasses predominate, or in general on old meadows, while phosphates and potash fertilizers are to be preferred where there is considerable clover mixed with the grasses.

An application of 200 kg. superphosphate per hectare (180 lbs. per acre), or a corresponding quantity of other phosphates, proved sufficient in case of spring grains, when not more than 100 to 200 kg. of nitrate of soda was applied, or when the soil itself was not especially rich in nitrogen from a large humus content.

The average relative weights of 1,000 kernels of oats and of barley from plats that received different fertilization are shown below, that of grain harvested on unfertilized plats being placed at 40 gm.:

Influence of fertilizers on weight of kernels.

	Number of trials.	Weight of 1,000 kernels.				
		Two applications nitrogen + phosphoric acid + potash.	One application nitrogen + phosphoric acid + potash.	Phosphoric acid + potash.	Nitrogen + potash.	Nitrogen + phosphoric acid.
Oats:		*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
Clay soils	30	41.39	41.00	41.33	41.39	40.35
Loam soils	19	40.55	42.56	41.51	41.03	40.39
Sandy soils	4	42.54	43.01	42.41	42.62	40.96
Sandy loam soils	6	40.51	40.03	40.96	40.80	38.93
Average	59	41.25	41.65	41.55	41.46	40.16
Barley:						
Clay soils	15	43.65	43.11	41.35	41.99	41.52
Loam soils	11	43.97	43.36	41.98	41.64	41.28
Sandy loam soils	13	43.73	43.17	42.65	43.06	42.19
Average	39	43.78	43.21	41.99	42.23	41.67

The data presented show that the fertilizers applied had in general a favorable influence on the ripening of the grain, both in the case of oats and barley, and on all soils. A rather surprising result is shown in the fact that the fertilization with nitrogen and phosphoric acid both in case of oats and barley gave, on the average, smaller increase in the weight of kernels than the nitrogen + potash fertilizers, which suggests that the potash had at least as much influence on the seed formation as the phosphoric acid. It is noted that the results obtained on this point in the experiments of 1901, conducted by the author, point in the same direction (E. S. R., 14, p. 753).—F. W. WOLL.

Cooperative fertilizer experiments in Malmöhus County, Sweden, 1902, M. WEIBULL (*Kvartalsskr. Malmöhus Läns K. Hushåll. Sälsk., 1903, No. 1, pp. 146–213*).—The report presents a full account of 66 cooperative fertilizer experiments conducted under the auspices of the Malmöhus County Agricultural Society by the author, with results obtained and discussions. Twenty-three of the experiments were with sugar beets, 1 with carrots, 5 with potatoes, and the rest with pastures and small grains.

Samples of the different kinds of soils on which the trials were conducted were subjected to chemical and mechanical analysis, and the crops harvested were also examined chemically. Discussing the value of the analysis of crops grown for determining the fertilizer requirements of soils the author concludes that a single analysis of grain and straw from an unfertilized plat will not disclose the fertilizer requirements of the soil, but this can be done to a considerable degree of certainty by analyses of plants grown under different systems of fertilization. Fertilizer trials on a light clay soil sown to barley and oats showed that the soil was in need of nitrogen first of all, and then of potash, but not of phosphoric acid. The analysis of the soil itself gave evidence that it contained only a small amount of phosphoric acid or lime (nitrogen, 0.13 per cent; phosphoric acid, 0.06 per cent; potash, 0.09 per cent; lime, trace; iron oxid, 2.80 per cent; aluminum oxid, 3.70 per cent). The results of analyses of the oats grown on the various plats were as follows:

Analyses of oats grown on different plats.

	Grain.		Straw.		
	Nitrogen.	Phosphoric acid.	Potash.	Lime.	Magnesia.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Plat A, no fertilizer applied	1.26	0.86	1.61	0.30	0.13
Plat B, nitrogen	1.37	.91	1.41	.28	
Plat C, nitrogen + phosphoric acid	1.36	.96	1.55	.32	
Plat E, nitrogen + phosphoric acid + potash	1.32	.94	2.10	.28	
Plat H, phosphoric acid + potash	1.24	.86	1.86	.36	
Atterberg's standards:					
Maxima	1.95–2.72	0.91–1.09	2.21–2.81	0.58–.75	0.34–.43
Minima	1.20–1.36	.37–.50	.28–.73	.14–.21	.08–.13
Average	1.65	.70	1.45	.37	.22

The results of the analysis of the oats corroborate those obtained in the fertilizer trials, viz, that the fertilizer requirements of the soil are in the following order: Nitrogen, potash, and lime, with some magnesia. Other examples are given illustrating the correctness of this method of determining the specific fertilization which a certain soil demands for the production of maximum and economical yields.

Fertilizer experiments with sugar beets gave the result that the sugar content of the beets was increased slightly, but decidedly, by the application of nitrate of soda, while both phosphoric acid and potash depressed somewhat the percentage of sugar in the beets and reduced their purity. The richest beets were obtained on the plats receiving nothing but nitrate of soda (200 kg. per hectare, or 189 pounds per acre).

viz, 18.6 per cent sugar in the beet, with a purity coefficient of 92, the corresponding figures for the unfertilized plats being 17.8 per cent and 85. The variations in the quality of the beets harvested were of minor importance in all cases, suggesting strongly, therefore, that under normal conditions the quality of sugar beets is not affected to any appreciable extent by the application of the ordinary artificial fertilizers.—F. W. WOLL.

Some plant culture trials with a new artificial fertilizer, A. YSTGAARD (*Tidsskr. Norske Landbr., 10 (1903), No. 8, pp. 357–365*).—The fertilizer experimented with was manufactured by fusing a mixture of phosphatic materials (apatite, rock phosphate, bone ash) with carnallite and kieserite for 10 to 15 minutes at 650 to 800° C. A sample of the fertilizer analyzed by the author contained 20.71 per cent total phosphoric acid, 15.23 per cent phosphoric acid soluble in a 2 per cent citric-acid solution, 9.92 per cent lime, 10.20 per cent magnesia, 6.85 per cent potash, and 16.47 per cent chlorin. The effect of the fertilizer when applied to oats and peas was somewhat better than that of Thomas phosphate, especially as regards the yields of grain obtained.—F. W. WOLL.

Wolters phosphate, P. WAGNER (*Mitt. Deut. Landw. Gesell., 18 (1903), No. 46, pp. 257, 258*).—This material, which is prepared by fusing 100 parts of coarsely crushed phosphorite with 70 parts of acid sodium sulphate, 20 parts of calcium carbonate, 22 parts of sand, and 6 to 7 parts of coal, was compared with superphosphate and Thomas slag in 29 pot experiments during 1903 with oats grown on loam soil. The superphosphate used contained 17.7 per cent of water-soluble phosphoric acid, 18.9 per cent total phosphoric acid; the Thomas slag 18 per cent of citric acid soluble phosphoric acid, 19.9 per cent total phosphoric acid. All of the phosphoric acid of the Wolters phosphate (15.7 per cent) was soluble in citric acid. The Wolters phosphate was as quick acting and as effective as the superphosphate and was apparently much more readily assimilated by plants than Thomas slag.

Experiments of the Royal Bavarian Moor Culture Station on the effect of potash fertilizers on upland moors, A. BAUMANN (*Vrtljschr. Bayer. Landw. Rath., 8 (1903), No. 2, Sup., pp. 425–452*).—The results of experiments with various kinds and combinations of fertilizing materials are reported, from which the general conclusions drawn are that the application of Thomas slag in the spring should under all circumstances be avoided on account of the solubility of harmful constituents of the slag in the acids of the moor soils. Fertilizing with potash and phosphoric acid should, however, be done in the spring rather than in the fall. The best results were obtained in these experiments by using Belgian phosphate with 40 per cent potash salts. In the author's opinion other mineral phosphates might be used with equal advantage.

The fertilizing value of iron sulphate, E. LECLERCQ (*Bul. Cercle Études Agron. [Brussels], 1903, No. 8, pp. 360–362*).—Noting the influence of iron sulphate applied for the destruction of weeds in increasing the vigor and yield of various crops, the author undertook plat experiments to determine the cause of this beneficial effect. In these experiments it was found that 250 kg. of iron sulphate produced as great an effect on oats as 150 kg. of nitrate of soda, not taking into account the benefit derived from the destruction of weeds by the iron sulphate. The author attributes the beneficial effect of the iron sulphate solely to the iron and not to the sulphuric acid.

Recent observations and investigations on the use and action of commercial fertilizers, STEGLICH (*Mitt. Oekon. Gesell. Sachsen, 1902–3, pp. 33–52*).—A general summary.

Analyses and valuations of fertilizers, J. P. STREET, W. P. ALLEN, and V. J. CARBERRY (*New Jersey Stas. Bul. 168, pp. 54*).—This bulletin discusses the trade values of fertilizing ingredients in 1903; the cost, value, and guaranteed and actual composition of fertilizers, home mixtures, and special fertilizers; and reports the

results of examination of 66 samples of standard unmixed fertilizing materials, 390 brands of complete fertilizers representing 101 manufacturers, 24 incomplete mixtures, 34 samples of ground bone, and 7 samples of miscellaneous products.

In addition there are reported the analyses of 6 samples of home mixtures and 18 samples of mixtures especially compounded by manufacturers to order. The materials examined included, in addition to the mixed fertilizers, nitrate of soda, sulphate of ammonia, dried blood, dried and ground fish, tankage, superphosphates, muriate of potash, sulphate of potash, kainit, inner coating of hides, tannery refuse, wool waste, sheep manure, and nitrate of potash. About 37 per cent of the brands of fertilizers examined were deficient in one or more of the different forms of plant food. The averages for all brands of complete fertilizers examined during 1903 were as follows: Total nitrogen, 2.27 per cent; total phosphoric acid, 10.52 per cent; available phosphoric acid, 8.15 per cent; insoluble phosphoric acid, 2.37 per cent; potash, 5.49 per cent; station valuation, $20.50; selling price, $27.57.

Analyses of commercial fertilizers, W. Frear (*Pennsylvania State Dept. Agr. Bul. 114, pp. 115*).—A report on inspection of fertilizers in Pennsylvania during the 7 months ended July 31, 1903, including analyses of 542 samples with a discussion of the results and notes on valuation of fertilizers in 1903.

FIELD CROPS.

The influence of the water content of soils on the yield and growth of different varieties of grain, C. Von Seelhorst and W. Freckmann (*Jour. Landw., 51 (1903), No. 3, pp. 253–269*).—Experiments with different varieties of summer wheat, oats, and barley, grown in pots in which the moisture content of the soil varied in different cases from 40 to 85 per cent of saturation, are reported. The results show that there is a close relation between the yield and the growth of individual plants and the water content of the soil, but that the influence of soil moisture varies widely with different varieties, thus confirming previous results (E. S. R., 14, p. 345).

Miscellaneous field crops in New South Wales, W. Farrer, G. L. Sutton, et al. (*Agr. Gaz. New South Wales, 14 (1903), No. 9, pp. 852–857, 884–887, 903–926, 929–936, 941–944, 947–950, 952, 953, pls. 7*).—The work with field crops, consisting mainly of variety and culture tests with cereals and forage crops, including grasses, roots, and leguminous plants, conducted at the Hawkesbury College, Wagga, Bathurst, Wollongbar, Coolabah, Moree, Belindigarbar, and Glen Innes experiment farms in 1902, is briefly noted. The different crops and varieties grown at the various farms are enumerated.

Varieties of wheat quite rust-resistant when sown before midwinter were badly affected when sown in the spring. Macaroni wheats compared well with other kinds in rust and drought resistance. At one of the farms the viability of seeds of different varieties treated with copper sulphate varied from 2 to 70 per cent.

Field crops at the Queensland Experiment Farms, J. Mahon et al. (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 408–446, pls. 2*).—In connection with reports covering all the work of the different State experiment farms at the Queensland Agricultural College, Westbrook, Hermitage, Biggenden, Gindie, and Cairns, the experiments with a large number of field crops, consisting mainly of variety and culture tests with cereals, grasses, roots, and other forage crops, are briefly noted. The varieties of the different crops under test are enumerated.

Results of experiments with lime as a fertilizer, D. Pryanishnikov (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4 (1903), No. 3, pp. 257–266*).—The use of lime as a fertilizer for a mixture of oats and vetch gave varying results, the percentage of vetch increasing in some instances and decreasing in others when lime was applied.

These differences in the results are considered due to the action of lime on the mineral constituents of the soil in some cases, and on the nitrogenous organic substances in others.

Wheat and yellow lupines gave an increase in yield as the amounts of lime applied were increased to 1 per cent of the weight of the soil. This result with lupines was unexpected. In acid clayey soils, oats was benefited when lime was applied at the rate of $\frac{1}{4}$ or $\frac{1}{2}$ per cent of the soil weight, but when the lime was increased to 1 per cent the yield was greatly reduced. From these experiments the author concludes that lime on other than sandy soil may be beneficial to lupines, while on some soils too great amounts may prove injurious to cereals. In studying the influence of lime on the nitrogen content of the soil in the absence of plants the author found that an application of 0.2 per cent of the soil weight very appreciably increased nitrification in chernozem soil.—P. FIREMAN.

Top-dressing for moorland pastures, H. VON FEILITZEN (*Svensk. Mosskult. Tidskr., 16 (1902), No. 2, pp. 171–185*).—The results of cooperative fertilizer experiments on 24 different farms during the year 1901 indicate that top-dressing moorland pastures is profitable.

The author states that, if the moor is of such a character that a yield of about 4,450 lbs. per acre may be expected, an application of about 85 lbs. of potash per acre with large quantities of phosphoric acid is advisable during the first years of cultivation. The application can later be decreased to such quantities as are taken off in the hay crop or washed out with the rainfall. From 30 to 35 lbs. of phosphoric acid per acre is considered an average application. On land kept in grass for several years a top-dressing with barnyard manure or compost has proved advantageous, especially on incompletely decayed moors.—F. W. WOLL.

On the improvement of natural meadows on humus soils, H. VON FEILITZEN and R. TOLF (*Svensk. Mosskult. Tidskr., 16 (1902), No. 4, pp. 311–322*).

Cooperative forage experiments in Southern Victoria, F. J. HOWELL (*Jour. Dept. Agr. Victoria, 2 (1903), No. 2, pp. 97–120, pls. 13*).—Corn, Amber cane, teosinte, Egyptian corn, Kafir corn, Pearl millet, mangels, beets, and alfalfa were tested, and the yields together with the increase on plats receiving commercial fertilizers are given in tables. Brief notes on the tests and apparent value of the different crops are presented.

The experiments showed that these crops may be grown in succession and supply green forage from the time the spring pastures fail until early-sown winter crops are available. For improvement of corn for forage a greater stooling tendency and a larger proportion of leaf are considered requisite. Amber-cane sorghum and Japanese millet proved successful, and rape produced very large yields. For Long Red and Yellow Globe mangels, yields of 31.31 and 47.56 tons respectively are recorded. The superior yield of the Yellow Globe is believed to be due to the fact that this variety is better adapted to shallow and not very friable soils than the Long Red. Rape and mangels showed the same wide range of adaptability to the soils of the region. Cowpeas and soy beans gave promise of value; and the use of commercial fertilizers on soils of poor and medium quality producing forage crops was found profitable.

Forage plants, D. O. NOURSE (*Virginia Sta. Bul. 145, pp. 15–19*).—This bulletin presents in brief notes the results obtained with a number of forage crops at the station in 1901 and 1902. Several varieties of sorghum, cowpeas, and soy beans were grown in this connection.

Competitive culture of fodder beets, E. VOGLINO (*Concorso per la coltivazione delle barbabietole da forraggio. Turin: G. Derossi, 1903, pp. 27, fig. 1*).—Nine varieties of fodder beets were grown in a prize contest and the methods of cultivation are described and the results reported. The sugar content ranged from 3.66 to 8.28 per cent, and the yields from 367 to 594 cwt. per hectare. It is concluded from the

results obtained that the sugar content of fodder beets in the region concerned i more dependent upon the soil and methods of cultivation than upon the variety. I general the varieties low in sugar content gave the best yields.

Selection of fodder beets, P. Zabrinski (*Zeml. Ghaz., 1902, No. 49; abs. in Zhur Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 3, pp. 356, 357*).—From result obtained by Zaykevich in 1901 the author concludes that the form and specific grav ity of fodder beets bear relation to the sugar content.—P. FIREMAN.

Florida beggar weed, G. d'Utra (*Bol. Agr. São Paulo, 4. ser., 1903, No. 6, pp 251–266*).—In connection with a discussion of the culture, uses, and value of th crop, analyses made before, during, and after the flowering period are reported an compared with the composition of a large list of leguminous crops at the correspond ing stages of growth.

Abnormal growth of carrots, E. Gross (*Deut. Landw. Presse, 30 (1903), No. 97 p. 831, fig. 1*).—The results of observation and experiments carried on for 3 year indicate quite conclusively, according to the author, that transplanting carrots induce abnormal forms. It is stated that conditions similar to those resulting from trans planting are accidentally caused in hoeing or cultivating, and that the occurrence o malformed specimens may be ascribed to this fact. On loose friable soils the abnor mal forms of transplanted carrots were less pronounced than on soils of a hard tex ture. Ten typical specimens of transplanted carrots weighed on an average 192.8 gm each, as compared with 87.7 gm. for specimens which had not been transplanted This difference was partly due to the greater area given each plant in transplanting but mainly to the abnormal branching of the transplanted specimens.

The growth of crimson clover, C. L. Penny (*Delaware Sta. Rpt. 1902 pp. 79–84*).—A comparison was made in 1901 between the weight and the composi tion of roots and tops of crimson clover 3 or 4 weeks before full bloom and durin full bloom. The samples studied were taken from a loose sandy soil and from heav clay.

At the earlier stage of growth the roots of the samples from the sandy soil consti tuted about 40 per cent of the whole plant, and those from the clay soil about 25 pe cent, and at the later stage of growth approximately 32 and 12 per cent, respectively In discussing these results the author calls attention to the greater ease of recoverin roots from the sandy soil, and to the fact that during the interval the samples wer taken the tops on the sandy soil increased considerably less than those on the cla soil, thus materially affecting the ratio between tops and roots. It is further state that root development may possibly be greater in sandy soil. About three-fourths o the roots on both soils were found within 6 in. of the surface, and it is concluded tha quantitatively the manurial value of the crop is almost entirely in the portion nea the surface.

The fertilizing constituents as determined in these experiments are shown in th following table:

Fertilizing constituents of crimson clover at different stages of growth.

Date of cutting.	Portion of plant.	Composition of air-dry substance.			Quantities per acre.			Yield per acre.
		Potash.	Phosphoric acid.	Nitrogen.	Potash.	Phosphoric acid.	Nitrogen.	
		Per ct.	*Per ct.*	*Per ct.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Sandy soil:								
April 22	Tops	1.88	0.49	3.35	50.2	13.1	89.6	2,67
April 22	Roots	.59	.40	2.31	10.8	7.3	41.9	1,81
May 17	Tops	1.13	.36	2.16	51.2	16.2	97.9	4,5
May 17	Roots	.54	.36	1.96	11.4	7.7	41.4	2,11
Clay soil:								
April 26	Tops	3.72	.64	3.25	110.3	18.8	96.4	2,9
April 26	Roots	1.88	.44	2.73	19.0	4.4	27.6	1,0
May 22	Tops	2.77	.48	2.63	175.2	30.3	166.4	6,3
May 22	Roots	1.18	.55	2.51	10.2	4.8	21.8	8

The data obtained on the sandy soil show but a small increase in fertilizing constituents during the 4 weeks preceding full bloom, while the results from the clay soil showed a marked gain.

The root surface of 1 gm. of fine roots from a sample produced on the sandy soil and taken April 22 amounted to 208 sq. cm. With this result as a basis, the aggregate surface of the fine roots within the first 2 ft. of soil is calculated to be about 4 times the surface of the land itself.

Clover sickness of soils, B. B. VEENER, N. A. DYAKONOV, and P. S. KOSSOVICH (*Trudi Syez. Dyeyat. Selsk. Khoz. Opuitn. Dyelu., 1901, pp. 31–41; abs. in Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 4, pp. 484–486*).—It has been observed by the Shatilov Experiment Station that the yield of clover in that region, even on the best farms, is low and that lands newly sown to clover give the higher yields. Phosphates proved to be the most effective fertilizer for clover and the best stand was obtained when sown without a nurse crop.

In the Government of Tula pot experiments with chernozem soil showed that clover sickness really existed and that it was not exclusively due to the lack of plant food.—P. FIREMAN.

Maize on hill and vlei soils (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 19, pp. 681–692, pl. 1*).—Comparative tests of different fertilizer mixtures on corn grown on hill (red loam) and flat (dark-gray clay loam) soils are reported. The results, briefly summarized, were that lighter applications were more profitable than heavier; phosphoric acid was apparently the most needed single element on the hill soil; nitrogen increased the growth of fodder but not of grain, and both nitrogen (nitrate of soda) and potash (muriate) salts retarded germination when applied in the hill; the yield of grain was increased to some extent by the use of potash; the effect of fertilizers was less marked on the flat soil; of the 3 phosphates used—superphosphate, slag, and bone—the first gave the most profitable returns.

The chemical composition of different parts of the corn kernel, C. G. HOPKINS, L. H. SMITH, and E. M. EAST (*Jour. Amer. Chem. Soc., 25 (1903), No. 11, pp. 1166–1179, pls. 2*).—This has been noted from another source (E. S. R., 15, p. 352).

Thirty-fifth annual report of the Flax Supply Association for the improvement of the culture of flax in Ireland (*Belfast: Flax Supply Assoc., 1903, pp. 103*).—The statistics given have reference mainly to the United Kingdom, but in addition statistics regarding the industry in different countries are briefly presented.

The cold storage of hops, C. ARMSTRONG (*Proc. Cold Storage and Ice Assoc., 4 (1903), No. 1, pp. 26–34*).—A brief paper, followed by general discussion.

Oats, DENAIFFE and SIRODOT (*L'Avoine. Paris: J. B. Baillière & Sons, 1902, pp. 848, figs. 213*).—This work presents at some length the description, classification, and anatomical structure of the grain of French and other varieties of oats, together with a consideration of the culture, composition, uses, storing, and national and international commerce of the crop. In addition to the topics mentioned, insects and diseases attacking the oat plant, injurious effects of weeds, cost of production, financial returns, transportation, and tariffs affecting the production and the price of the crop are discussed.

Tests of oats and wheat at Uniontown in 1903, J. F. DUGGAR and J. M. RICHESON (*Alabama Canebrake Sta. Bul. 19, pp. 11*).—The average results of 3 experiments show that fall-sown oats which received 100 lbs. of nitrate of soda per acre yielded 14.75 bu. of grain per acre more than the check tests, while the plats receiving 200 lbs. yielded 25.3 bu. more. Estimating the cost of the nitrate at $60 per ton, the increase with 100 lbs. of nitrate was produced at a cost of 20.3 cts. per bushel, and with 200 lbs., at a cost of 23.8 cts. per bushel. The oats were estimated at 50 cts. per bushel. The average yield of straw on the check plat was 1,070 lbs.; on the plat receiving 100 lbs. nitrate, 1,738 lbs.; and on the plat receiving double this quantity, 2,608 lbs. per acre.

Thoroughly cured sheaf oats from the unfertilized plats and from those receiving the smaller and the larger quantity of nitrate of soda contained 39, 38, and 33 per cent of grain, respectively. A plat of oats sown January 31 and fertilized at the rate of 80 lbs. nitrate of soda per acre showed an increase of 8 bu. per acre over the check plat, which was equivalent to a profit of $1.60. Oats receiving an excessive application of 3,466 lbs. fresh cotton seed per acre yielded 39 bu., or 18 bu. more than the unfertilized crop, while the plat receiving an equal quantity of nitrogen in the form of cotton-seed meal produced only 23.2 bu. per acre. Nitrate of soda at the rate of 160 lbs. per acre on oats sown March 25 proved detrimental. On these late oats 200 lbs. cotton-seed meal per acre was practically without effect.

The results of these and previous experiments were in favor of fall sowing. Seed of Red Rust Proof oats scalded for 10 minutes in water at a temperature of 133° F., produced a crop free from smut, while the oats from untreated seed contained 3 per cent of smutted heads. The scalded seed also produced 1 bu. of grain more per acre than the untreated seed. Of different methods of soil preparation for oats, plowing and harrowing the soil, plowing in the seed, and then rolling the ground gave the best results. Leaving the surface a little rough is considered a partial protection against winterkilling.

Owing to rust, fertilizer experiments with wheat did not give reliable results.

On the improvement of the Swedish potato industry, with a report on culture trials with potatoes, H. JUHLIN-DANNFELT (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), No. 2, pp. 147–180*).

Sugar beet experiment, C. L. PENNY (*Delaware Sta. Rpt. 1902, p. 84*).—Only one test was made. The average weight of the beets was about 5½ oz., the sugar content of the juice by weight 20.7 per cent, and the purity 87.2. The beets lost 19 per cent in topping, and the yield of topped beets per acre was 11,887 lbs. On this basis the yield of sugar would amount to 2,209 lbs. per acre. The experiments in this line thus far conducted by the station are not regarded as conclusive, but the results given above are not considered favorable for the sugar-beet industry in Delaware.

Respiration in the sugar beet, F. STROHMER (*Abs. in Centbl. Agr. Chem., 32 (1903), No. 7, pp. 465–469*).—Experiments were conducted to study the cause of the loss in sugar occurring in stored beets. The respiration products in several series of sample beets, all of the same variety and obtained from the same source, were determined and the influence of various factors was noted. The tops of the beets were removed and only a few buds allowed to remain at the crown. Each sample beet was under test from 70 to 72 hours.

The results did not show that the respiration products of the sugar beet contain other carbonaceous gases in addition to carbon dioxid. The loss of sugar in stored beets was found to be larger than was indicated by the quantity of carbon dioxid exhaled. A definite relation between the original sugar content of the beet and the quantity lost by respiration could not be established, and the total loss in sugar, other conditions being equal, was not parallel with the increase in sugar content. Neither did the quantity of sugar lost during storing and the quantity reduced to nonsugars show any connection. Respiration is regarded as the strongest factor in causing loss of sugar in nonsprouting beets.

Storing at the lowest possible temperature is recommended because it reduces the loss in sugar to a minimum and in other ways preserves the quality. In sprouting beets the loss from reduction to nonsugars is much greater than the loss due to respiration. It is stated that cane sugar in the beet serves as material used in respiration, in which connection it is broken up into carbon dioxid and water and as a reserve substance utilized in the development of new organs, or in growth in general, in which a mere rearrangement of its atoms takes place.

According to results obtained by the author and others the fodder and sugar beet are injuriously affected by a temperature between −1° and −1.1° C. A temperature

of 0° C. will keep beets in perfect condition for weeks. Even slightly frozen beets may be brought back to a normal condition if allowed to thaw out slowly and gradually, which shows that freezing is not necessarily destructive.

There was no indication of a relation between the activity in respiration and the content of either sugar, total nitrogen, or albuminoid nitrogen. A high sugar content was not always associated with an intense activity in respiration.

Intramolecular respiration, which takes place when oxygen is lacking, was also observed in the beet, and at temperatures ranging from 2 to 4° C. perceptible quantities of carbon dioxid were given off. Ethyl alcohol is considered a product of intramolecular respiration in the beet root. The following table shows the range in loss of sugar under normal respiration at different temperatures:

Range of loss in sugar and its carbon dioxid equivalent per 100 kg. of beets during 24 hours of storage.

Temperature.	Sugar.	Carbon dioxid equivalent.
Deg. C.	*Grams.*	*Grams.*
0	2.30– 5.18	3.55– 7.99
5	10.35–18 69	15.98–28.86
10	23.01–29.62	35.52–45.73

Seedling and other canes in the Leeward Islands, 1902–3, F. WATTS (*Imp. Dept. Agr. West Indies, Pamphlet 27, 1903, pp. 39*).—The results obtained with plant and ratoon canes in Antigua and St. Kitt's are briefly summarized. In Antigua seedling cane B 208 gave the best average results. Other promising canes were B 109, B 156, B 130, and B 306. The ratoon crop of these new seedlings retained the promising character.

In the St. Kitt's experiments Caledonian Queen and B. 208 headed the list of plant canes. Among the ratoon canes B. 306 gave the best results. The data obtained seem to indicate that selection affects the resulting canes to some extent. Cane tops proved superior to cuttings for planting, and Bordeaux mixture was most efficient in protecting the tops and cuttings against the attacks of fungus diseases and thus insuring the growth of the buds. Placing the tops and cuttings vertically and covering the ends produced better results than other methods of planting.

Ridge v. level culture for sweet potatoes, R. A. EMERSON (*West. Fruit Grower, 13 (1903), No. 4, p. 22*).—An account is given of growing sweet potatoes in Nebraska on ridges and with level culture, both with and without irrigation and with and without mulching. Level culture gave considerably the best results on the unirrigated and consequently dry soil. There was considerable advantage, on the other hand, in ridging where the soil was irrigated; and this difference was especially marked when the rows were also mulched. The increased yield secured by ridging on irrigated land amounted to 29 per cent, and to 53 per cent when the ridges were also mulched.

Variety tests of tobacco, E. CHUARD and G. MARTINET (*Chron. Agr. Canton Vaud, 16 (1903), No. 23, pp. 637–643*).—Of 6 American varieties, Improved White Burley showed the greatest adaptability to the new conditions and is considered of greater value for the region than any other of the varieties tested. The seed obtained from America gave a larger yield than the seed produced by this crop.

Report of the tobacco expert, R. S. NEVILL (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 457, 458*).—Six varieties of tobacco, Lax, Blue Pryor, Yellow Pryor, Heston, Conqueror, and Burley, were grown. The season was dry, and of the varieties tested Lax proved by far the most drought-resisting and the only one giving a fair yield.

Wild rice; its uses and propagation, E. BROWN and C. S. SCOFIELD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 50, pp. 24, pls. 7*).—This bulletin discusses the distribution and habitat of wild rice, together with its life history and natural propagation; gives the botanical description and a discussion of the general morphology of the plant; notes the methods of harvesting the seed and preparing it for food purposes; and presents suggestions for harvesting, storing, and planting. In the consideration of the food value of wild rice its chemical composition is compared with the chemical composition of a number of common cereal grains. Analyses furnished by the Bureau of Soils of this Department, of soil samples taken from wild rice beds near Bemidji, Minn., on the Potomac Flats near Washington, D. C., and from Chesapeake Beach, Md., are reported.

Measurements of wild-rice seed obtained from the Potomac River, Port Hope, Ont., and Minnesota, were made by the authors to show the difference in size of seeds from different regions. The northern-grown seeds were found to be larger and much thicker than the seeds from the Potomac. The results of a series of experiments, partly cooperative, seem to indicate "that wild rice can be successfully grown from seed either by sowing the fresh seed as soon as it is gathered or by keeping it in water over winter and sowing in the spring."

Report on the agricultural work in the botanic gardens and the government laboratory for the year 1902–3, J. B. HARRISON (*Georgetown, British Guiana: Govt. Printer, 1903, pp. 40*).—The results of culture tests of seedling sugar canes and of older varieties are reported. The areas occupied by various seedling varieties in 1902 and 1903 and the number of plantations on which each kind was in cultivation are given in a table. The composition of the soil samples from fields used in this connection is also given. The general deductions from fertilizer experiments in progress since 1891 are similar to those previously noted (E. S. R., 15, p. 857).

The Estate Brody, E. WEISS (*Mitt. Landw. Inst. Univ. Breslau, 2 (1903), No. 3, pp. 437–510*).—The management of an estate devoted to the production of crops in connection with keeping comparatively little live stock is outlined. The cultivation of different crops, the treatment of the different kinds of soils, the rotations followed, the methods of applying fertilizers, and the system of bookkeeping used are described.

The world's grain production in 1903 (*Die Getreideproduktion der Welt im Jahre 1903. Budapest: Min. Agr., Hungary, 1903, pp. 89*).—Statistics for 1903 of the grain production of the world by countries, as published by the Hungarian Minister of Agriculture.

The geographical distribution of grain prices in the United States from 1862 to 1900, T. H. ENGELBRECHT (*Die Geographische Verteilung der Getreidepreise in den Vereinigten Staaten von 1862 bis 1900. Berlin: Paul Parey, 1903, pp. 108, pls. 8*).—The fluctuations in the prices of wheat, rye, barley, oats, corn, buckwheat, potatoes, and hay in different sections of the United States from 1862 to 1900 are discussed and shown in tables and graphical illustrations.

Report of the [Queensland] secretary for agriculture, 1902–3, D. DENHAM (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 375–393, pl. 1*).—This report includes statistical information regarding the production of field crops in Queensland.

Season and crop report of Bengal for the year 1902–3, S. L. MADDOX (*Calcutta: Dept. Land Records and Agr., Bengal, 1903, pp. XXXIII*).—The character of the season is described and detailed statistics of all the important crops of the country are given in tables.

HORTICULTURE.

Report of the horticulturist, C. P. CLOSE (*Delaware Sta. Rpt. 1902, pp. 89–108*).—The subjects considered in this report are the value of spring applications of nitrate of soda for asparagus; thinning experiments with apples and peaches; pollination experiments with pears, peaches, and apples; root forcing of fruit trees; orchard cover crops; and notes on the station orchard.

In the experiment to determine the value of spring applications of nitrate of soda in the culture of asparagus, 200 lbs. was applied per acre in 4 equal portions at intervals of about 10 days. The first application was made about 2 weeks before the cutting season began. The weight of stalks obtained from a half acre fertilized with nitrate of soda was 460 lbs. On the unfertilized half acre the weight was 448 lbs. This slight difference in the yield of the fertilized over the unfertilized plat is not believed to be of any special significance. The use, therefore, of nitrate of soda on asparagus beds during the cutting season is not recommended.

Results of thinning experiments with apples for 1 year show an increase of from $1\frac{1}{2}$ to 3 times as much first-grade picked fruit on the thinned as on the unthinned trees. The yield of second and third grade picked fruit was also usually larger on the thinned trees. As regards dropped fruit, there was about 7 times as much first-grade fruit obtained from the thinned as from the unthinned trees. Of second-grade dropped fruit the greater amount was obtained under the unthinned trees. In total yield, 4 unthinned Lankford trees produced $117\frac{3}{4}$ baskets of apples, while the thinned trees produced $116\frac{1}{4}$ baskets. One of the peculiar features of this experiment was that notwithstanding all wormy fruit was first removed in thinning, at the end of the season 60 per cent more of the thinned fruit was wormy than of the unthinned fruit.

The experiments with peaches included comparisons between the percentages of fancy fruits and firsts obtained from unthinned trees, and from trees on which the fruit had been thinned immediately after the June drop to 4, 6, and 8 in. apart, respectively, and to these same distances apart on other trees about 3 weeks later, when the pits were beginning to harden. The results secured with well-loaded Elberta trees are shown in the following table:

Comparative yield of peaches from thinned and unthinned trees.

Method of thinning.	Fancy fruits.	Firsts.	Yield of thinned as compared with unthinned trees.
	Per cent.	*Per cent.*	*Per cent.*
Unthinned	48	49	100.0
Thinned early 4 in. apart	51	47	85.8
Thinned early 6 in. apart	60	39	104.0
Thinned early 8 in. apart	80	20	71.0
Thinned late 4 in. apart	49	51	101.5
Thinned late 6 in. apart	80	20	71.0
Thinned late 8 in. apart	73	26	84.5

The table shows a considerable increase in the percentage of fancy fruits and firsts due to thinning. The author recalls in this connection that in previous experiments early thinning to 8 in. apart has given the best results. The last column of the table shows the comparative yields obtained on the thinned trees, calling the yield from the unthinned trees 100.

The work in pear and apple pollination is in continuation of that previously reported by the station (E. S. R., 14, p. 252). Out of a total of 612 cross-pollinations between apple blossoms of Paragon, Stayman, Winesap, and Lily of Kent only 1 fruit set. Kieffer and Angouleme pears also proved practically self-sterile.

In testing the self-fertility of Old Mixon, Reeves, Elberta, Globe, Crawford Late, and Fox peaches the self-fertility of the blossoms was found to vary between 70 and 88 per cent, the average being 81 per cent. These fruits may therefore be safely planted in solid blocks without danger of reducing the set of heavy crops of fruit.

An attempt was made to secure an increased root development of young orchard trees by increasing their callusing surface. Strips of bark $\frac{1}{2}$ in. wide were cut from the side of the main root and the larger side roots, with the expectation that numerous new roots would be sent out from these places. The experiment was made with

a number of fruits, but only the results secured with peaches are reported. The data obtained with this fruit show that no more roots were obtained from those trees from which strips of bark had been removed than from the control trees, and the experiment from this standpoint was a failure. However, the removing of the strips of bark appeared to have a very stimulating effect on the growth of the main root in particular and the whole root system in general. The top growth of the trees where 2 strips of bark had been removed averaged 44.7 ft. When one strip of bark was removed the top growth averaged 36.1 ft. With the control trees the top growth was but 23.9 ft., and the root system graded but 62, as compared with a grade of 82 and 89 for the trees from which strips of bark had been removed.

The notes on orchard cover crops have been abstracted from another source (E. S. R., 15, p. 361).

Biennial report of the State board of horticulture (*Utah State Bd. Hort. Rpt. 1901–2, pp. 69, pls. 16*).—This report contains an account of the work of the State board of horticulture in investigating the horticultural work of the State for the 2 years 1901–2. It has been definitely determined that fruit trees, when properly pruned and scraped and then given 2 thorough applications of a lime, salt, and sulphur mixture, may be completely freed from the San José scale. With trees more than 30 years old, however, it has been found cheaper to cut them out than to attempt to spray them. It is not deemed practicable nor advisable to attempt to fumigate trees in combating the San José scale, since the lime, salt, and sulphur treatment is equally effective and costs only about a fourth as much.

Investigations on the codling moth appear to indicate that there are no distinct broods of the worms, but that hatching is continuous after the temperature reaches 65° F. at night. In order to control this pest, therefore, spraying at least once every 20 days throughout the season after the blossoms fall is advised. From 80 to 95 per cent of apples free from worms have been obtained by careful attention to spraying.

An account is given of the work and expenditures of the experiment farm for 1901–2. The farm is designed as a model, as well as for experimental purposes. Some of the canning factories of Utah are described, and an account given of the work they are doing. Pear blight has been controlled in some of the orchards reported on by constant attention to the pruning out of infected parts of the tree. A number of miscellaneous recommendations are made regarding the culture of fruit in Utah, and spraying for the control of insect pests and the diseases of fruit trees.

Report of the fruit expert, W. J. Allen (*Agr. Gaz. New South Wales, 14 (1903), No. 9, pp. 811–847*).—This report deals with phenological data and descriptions of a large number of different kinds of fruits grown at Wagga, Hawkesbury, Bathurst, Moree, Perabore, and Wollongbar orchards. Nearly all kinds of temperate and subtropical fruits are considered. In a 3-years' trial of ringing Zante currants, especially good results were obtained during the first 2 years, which appeared to be favorable seasons for the practice. The third year, however, the practice resulted very disastrously; the vines set no fruit, and in a few cases died, and on the whole it greatly weakened them. From the 3-years' trial the conclusion is drawn that in favorable seasons the practice increases the returns without being harmful or interfering with the longevity of the vine; but where the grower is dependent upon the rains in a dry district, it is both dangerous and undesirable.

The handbook of horticulture and viticulture of Western Australia, A. Despeissis (*Perth: W. A. Watson, Govt. Printer, 1903, 2. ed., pp. 620, pls. 8, figs. 299*).—This is a very comprehensive guide to the propagation, culture, and marketing of all the usual fruits, and, to a more limited extent, vegetables grown in Western Australia.

A laboratory manual in systematic pomology, U. P. Hedrick (*Mich. Agr. Col., pp. 91*).—This manual represents "an effort to place before the students of pomology in the Michigan Agricultural College a means by which an intimate and accurate knowledge of pomology may be acquired."

Judging fruit by scale of points, F. A. WAUGH (*West. Fruit Grower, 14 (1903), No. 5, pp. 1–3*).—This is a paper read before the American Pomological Society at its recent meeting in Boston. It contains suggested scales of points for judging apples and pears, grapes, peaches, plums, and strawberries. A score card originated by A. T. Goldsborough for judging strawberries is also given.

Fruit culture in Costa Rica, C. WERCKLE (*Tropenpflanzer, 7 (1903), No. 9, pp. 425–439*).—A detailed account is given of all of the foreign and native fruits grown in Costa Rica.

Fertilization and hybridization, H. DE VRIES (*Befruchtung und Bastardierung. Leipzig: Von Veit & Co., 1903, pp. 62*).—A lecture delivered before the Holland Scientific Society at Haarlem, May 16, 1903.

The question of varieties, L. H. BAILEY (*West. Fruit Grower, 14 (1903), No. 2, pp. 1–4*).—This is a paper read by the author before the Nurserymen's Convention, with the discussions of the same by nurserymen.

The culture and marketing of orchard and garden fruits, W. F. MASSEY (*North Carolina Sta. Bul. 184, pp. 86–125, figs. 22*).—This bulletin contains an elementary discussion of the classification of plants and the functions of roots, stems, buds, leaves, flowers, etc., with detailed directions for the propagation, planting, cultivation, and marketing of pears, peaches, plums, cherries, quinces, figs, and pomegranates. The best varieties of these various fruits for North Carolina conditions are noted, with brief descriptions of the same.

Experiments in fertilizing orchards, C. LIERKE (*Wiener Illus. Gart. Ztg., 28 (1903), No. 10, pp. 371–376*).—In addition to a discussion of the general requirements of the different fruits as regards potash, phosphoric acid, and nitrogen, figures covering a period of years are given, which show the increased yield obtained by the use of fertilizers containing these elements, and the much smaller yield obtained when any single element was omitted from the fertilizer formula.

Pruning, L. C. CORBETT (*U. S. Dept. Agr., Farmers' Bul. 181, pp. 39, figs. 25*).—This bulletin treats of the methods and principles of pruning as applied to orchard and small fruits, hedges, shade and timber trees, and flowering shrubs.

Some notes on canning fruits and vegetables, W. B. ALWOOD (*Virginia Sta. Bul. 146, pp. 23–47*).—Detailed directions are given for canning tomatoes, snap beans, sweet corn, apples, crab apples, and plums. The work is based on the results secured at the station in putting up fruits and vegetables in a small canning factory.

The detailed portion of the bulletin is preceded by a discussion of the principles which underlie the processing of canned goods. Contrary to the recommendations of several writers on processing tomatoes in a retort at a high temperature, the author finds that cooking the stock at a boiling temperature in an open kettle for 25 minutes is most desirable. When the tomatoes were cooked for 45 minutes in an open kettle at boiling the stock was practically reduced to slop.

The most satisfactory varieties of snap beans used for canning have been the Mammoth Stringless Valentine, and the new Mammoth Stringless Green Pod. Cooking the stock 45 minutes at boiling in an open kettle has quite uniformly produced satisfactory results. Perhaps a little finer grade of stock was secured by cooking for 10 minutes in a retort, at 216° F, and then running the temperature up to 220° just at the close of the cooking.

Country Gentleman and Stowell Evergreen were the varieties of corn used for canning. In one experiment 30 bu. of Stowell Evergreen corn, measured with the husk on, produced 10 cases of packed corn; and 42 bu. of Country Gentleman, measured in the same way, packed 12 cases. Other data along the same line are given.

The Tolman Sweet variety of apples, when sugared and canned, was found to make a very excellent preserve. In cooking crab apples, from 2 to 3 oz. of sugar to each 3 lb. can seemed to be sufficient.

The apple in cold storage, G. H. POWELL and S. H. FULTON (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 48, pp. 64, pls. 6*).—Experiments have been conducted

for 2 years in different apple-growing sections of the country to determine the best methods for harvesting and keeping apples in cold storage. About 180 varieties of apples taken from localities in Kansas, Missouri, Illinois, Michigan, West Virginia, North Carolina, Delaware, Maine, Massachusetts, and New York have been used in the investigation.

Preceding the detailed results of the experiments a discussion is given of the influence of cold storage on the apple industry, the function of cold storage, principles of mechanical refrigeration, and statistics of the extent of the cold-storage warehouse industry in this country. The specific problems investigated were the effect of the degree of maturity at harvesting time on the keeping quality of the fruit, the effects of delayed storage, and of storing at different temperatures. In addition, the influence of different kinds of packages, wrapping of fruit, soil and cultural conditions, fruit from young rapidly growing trees and from old trees, etc., on the keeping qualities of the fruit in cold storage were investigated; as well as the effects of all the above factors on the development of apple scald during and after the removal from cold storage. The keeping qualities of about 180 varieties of apples used in the test are given in comparative notes.

As regards the best time to pick apples for storage, the results indicate that they should have reached full growth and high color before harvesting, but still be firm and hard when picked. Such fruit equals in keeping quality, and often surpasses, partially colored or less mature fruit. It is superior to such fruit in flavor and texture, more attractive in appearance, more saleable, retains its flavor longer, and is less subject to apple scald. Overripe fruit deteriorates rapidly unless placed in cold storage soon after picking.

In experiments with some unusually large Tompkins King and Sutton apples picked from rapidly-growing young trees, the fruit that was but three-fourths colored kept much better than fully colored fruit. When examined in February fully colored Tompkins King showed 28 per cent of physiological decay, while lighter-colored fruit from the same tree, picked and handled in the same manner, showed but 10 per cent of decay. In another instance small, mature fruit from older slower-growing trees kept well until the middle of April; while the commercial limit of fruit from young rapid-growing trees in cold storage was sometimes 3 months shorter. Late varieties of fruits may be picked when they are beginning to mellow, provided they are handled with great care and stored immediately in a temperature of 31 to 32° F. As a further protection, however, such fruit should be wrapped and stored in boxes.

As a means of securing better-colored fruit, pruning to let sunlight into the tree is suggested. Cultivation and cover crops which tend to vigorous growth and lighter-colored fruits may be withheld in part or the orchard seeded down until the desired condition is obtained. More uniform grades can be secured by picking trees over several times. This is especially desirable in the case of a specialist working up a fancy trade in apples.

Relative to the effects on keeping quality of delay in placing fruit after picking in cold storage, the authors found that when the weather at picking time was cool there was no apparent injury from delaying the storage of a large number of varieties of apples 2 weeks after they were picked. With warmer weather, however, a delay of 2 weeks seriously injured the keeping quality of the fruit. Rhode Island Greening, Tompkins King, and Sutton apples picked when the temperature averaged about 62° F., and stored within 3 days, kept firm until the following March without rot or scald; while fruit from the same trees not stored until 2 weeks after picking was badly scalded or decayed by January 1. "None of the immediate-stored fruit was scalded or decayed by the first of February, but the delayed Sutton and Rhode Island Greening apples were soft and mealy, and one-third were scalded at that time, while nearly 40 per cent of the delayed Tompkins King were soft and worthless.

The commercial value of these varieties was injured from 40 to 70 per cent by the delay in storage."

Relative to different temperatures: "The investigations indicate that the ripening processes are delayed more in a temperature of 31 to 32° F. than in 35 to 36° F. The apple keeps longer in the lower temperature, it scalds less, the fruit rots and molds are retarded to a greater extent; while the quality, aroma, flavor, and other characteristics of the fruit are fully as good and when removed from storage it remains in good condition for a longer period." Some fruit when very carefully picked and handled kept very satisfactorily at the higher temperature, but for general commercial work a temperature not higher than 32° F. is recommended.

A discussion is given of the physiological effects on apples in storage of freezing. The injury is seen in a more translucent appearance of the skin of the fruit, a waterlogged and spongy condition of the flesh, and a brownish discoloration of the flesh. "In the practical handling of frozen stock the temperature should be raised very slowly until the frost is withdrawn. If possible, the fruit should not be moved until it is defrosted, as it discolors quickly wherever a slight bruise occurs or even where the skin is lightly rubbed. With these precautions observed it is often possible to defrost stock that is quite firmly frozen without apparent injury to it."

Wrapping fruit with tissue, parchment, or waxed paper or unprinted newspaper was found a valuable means of preserving apples. It appears to retard the ripening of the fruit and to preserve it from decay several weeks or months longer than unwrapped fruit. Thus, the amount of decayed fruit April 29, averaged 17.6 per cent for 6 varieties when wrapped, and 41.7 per cent when unwrapped. Wrapping also prevents the transfer of rot throughout the package, and protects the fruit from bruising and discoloration due to rough handling. A double wrapper proved more effective than a single wrapper. No important difference was noticeable in the efficiency of the different wrappers.

Closed packages for apples have been found most satisfactory. In ventilated packages the fruits are likely to shrivel if stored for any considerable time. Small packages cool quickest and are therefore most satisfactory for delicate fruits or fruits in which it is desired to check the ripening process promptly. Cold-storage fruit was not found to deteriorate more rapidly after removal from the storage house than other apples equally ripe. "Apples should be in a firm condition when taken from storage, and kept in a low temperature after removal. A high temperature hastens decomposition and develops scald."

The effect of cold storage on the development of apple scald was quite thoroughly investigated. The conclusions reached relative to this subject are as follows:

"The scald is probably caused by a ferment or enzym which works most rapidly in a high temperature. Fruit picked before it is mature is more susceptible than highly colored, well developed fruit. After the fruit is picked its susceptibility to scald increases as the ripening progresses. The ripening that takes place between the picking of the fruit and its storage makes it more susceptible to scald, and delay in storing the fruit in hot weather is particularly injurious. The fruit scalds least in a low temperature. On removal from storage late in the season the scald develops quickly, especially when the temperature is high. It does not appear practicable to treat the fruit with gases or other substances to prevent the scald. From the practical standpoint the scald may be prevented to the greatest extent by producing highly colored, well developed fruit; by storing it as soon as it is picked in a temperature of 31 to 32° F., by removing it from storage while it is still free from scald; and by holding it after removal in the coolest possible temperature."

Cold storage for fruit (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, pp. 520–531*).—This article is largely made up of descriptions of methods of cold storage observed in a number of cold-storage establishments in the United States and also in the refrigerator car service.

Cherries and cherry growing in Iowa, H. C. Price and E. E. Little (*Iowa Sta. Bul. 73, pp. 45-98, figs. 27, chart 1, maps 2*).—Popular directions are given in this bulletin for growing cherries in Iowa. Statistics and maps showing the extent of production are included, together with descriptions of 74 varieties, a large number of which are Russian kinds and seedlings; a series of charts showing the blossoming season of many different sorts for 2 years; and an estimate by growers of the hardiness, freedom from disease, and productiveness of varieties in different sections of the State. The fruit and leaves of many of the varieties described are illustrated.

The Russian varieties of cherries were introduced into Iowa by Professor Budd in 1883, with the hope that they would prove hardy and productive and extend the successful culture of cherries far into the Northwest. Up to the present time they have failed to fulfill these expectations. They have proved much less immune to disease, and otherwise less suited to Iowa conditions than the sorts commonly grown in that State. It is hoped, however, that as they become further acclimated and mingled with the other varieties commonly grown seedlings may be obtained which will prove hardier and more productive than any of the varieties now in cultivation in the State.

An experiment was made to determine the value of netting in protecting cherries from birds during the ripening season. The material used was a light-weight block fish netting, with openings too small for the birds to get through. It was procured in Germany, and is believed to be too expensive for commercial use. One tree thus protected from the birds yielded 52 qts. of fruit, while an unprotected tree yielded but 32 qts. The following year the experiment was repeated, when the covered tree again yielded 20 qts. more of marketable fruit than the uncovered tree. After harvesting the fruit the netting is stored away for use in succeeding seasons. Where only a few trees are grown for family use it is believed that this method of protection may prove satisfactory.

In the authors' discussion of stocks on which to propagate cherries, they state that because of the severity of the winters in the Northwest neither the Mazzard nor Mahaleb are satisfactory, and that no definite conclusions have yet been reached regarding the value of native stocks such as Wild Bird cherry (*Prunus pennsylvanica*), Sand cherry (*P. besseyi*), and the Wild Black and Choke cherries. Suggestions are included for top-grafting.

Change in the composition of growing peaches, C. L. Penny and C. P. Close (*Delaware Sta. Rpt. 1902, pp. 87, 88, 98, 99*).—Analyses were made of samples of Elberta peach twigs, buds, blossoms, and fruit at 2 different stages of maturity, and of the shell and kernel of peach pits. The composition of the different parts as regards potash, phosphoric acid, nitrogen, starch, and sugar is shown in the following table:

Composition of Elberta peach twigs, buds, blossoms, and fruit.

	Moisture.	Potash.	Phosphoric acid.	Nitrogen.	Sugar.	Starch.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Twigs	52.87	0.29	0.11	0.50	2.88	16.55
Buds	55.61	.74	.38	1.23	.93	5.10
Blossoms	81.41	.57	.16	.69	2.86	2.06
Entire peach, June 6	87.97	.29	.02	.16	2.95	2.31
Entire peach, June 28	82.76	.33	.05	.18	1.98	3.64
Entire peach, Aug. 25	83.24	.29	.03	.10	7.42	1.98
Flesh of peach, Aug. 25[a]	....	2.32	.24	.63	61.94	7.31
Shells of pits, Aug. 25[a]	....	.33	.08	.19	3.21	25.10
Kernels of pits, Aug. 25[a]	....	1.02	.64	4.08	....	....

[a] Absolutely dry state.

It is stated that the average weight of 100 peaches when thinned June 6 was 2.3 lbs.; June 28, 6 lbs.; and at maturity, August 25, 28.6 lbs.

The orange on Citrus trifoliata (*Pacific Rural Press, 66 (1903), No. 22, p. 337, figs. 3*).—The results obtained in different parts of California from the use of *Citrus trifoliata* stock for oranges are discussed. It appears that in open culture trees on this stock make a very good growth. Satsuma and other varieties of the Mandarin class, varying in age from 5 to 9 years, make a growth in height and spread of from 8 to 10 ft. The stock appears to be especially resistant to drought, and varieties of orange and other citrus fruits worked upon it appear to stand 10° more cold than on any other stock. Trees budded on this stock are also reported to come earlier into bearing.

Production and consumption of oranges and lemons, R. M. BARTLEMAN (*U. S. Consular Rpts., 73 (1903), No. 279, pp. 620–622*).—Some statistics are given on the production and consumption of oranges and lemons in 15 different countries.

Hybrid mangoes (*Agr. News [Barbados], 2 (1903), No. 42, p. 374*).—Attention is called to the difficulty in the improvement of mangoes by hybridization, since the seeds of mangoes are polyembryonic, and it would therefore be practically impossible to tell whether a particular plant was a hybrid or not until it had grown and fruited.

Bush fruits, second report, H. L. PRICE (*Virginia Sta. Bul. 147, pp. 51–78, figs. 9*).—A report was made by the station in 1892 (E. S. R., 4, p. 728), on tests of a number of varieties of bush fruits. The work has been continued, and in the present bulletin an account is given of methods of cultivating raspberries, blackberries, currants, and gooseberries. Descriptions are given of the varieties of each fruit which have proved most successful at the station. The Success Juneberry is described as being more prolific and bearing larger fruit than the wild sorts. A few bushes are recommended for every garden. Such fruits as the Japanese wineberry, Loganberry, and dewberries have proved more or less hardy at the station, but are not considered worthy of cultivation except as novelties.

Grapes and small fruits, W. F. MASSEY (*North Carolina Sta. Bul. 187, pp. 51–74, fig. 1*).—This bulletin contains popular directions for the propagation, culture, and management of grapes, strawberries, raspberries, blackberries, dewberries, gooseberries, and currants.

The author states that since the advent of fungicides it has become possible to successfully cultivate nearly all varieties of grapes in the South. Remarkably good grapes have been produced on the pine barrens of North Carolina. For the Scuppernong and other varieties of the Vulpina class of grapes, which are most cultivated in the South, the author advocates an overhead arbor made with stout posts to which wires are stretched overhead high enough to work under with teams. The use of commercial fertilizers rather than stable manure is advocated. A mixture, consisting of about 3 per cent nitrogen, 8 per cent phosphoric acid, and 4 per cent potash, applied at the rate of about 500 lbs. per acre, is recommended for most soils. A large number of varieties which are thought most useful for cultivation in the South are briefly described.

In the notes on the culture of strawberries directions are given for winter forcing of these fruits in North Carolina. The Loganberry has been found very unproductive. The most successful method of propagating it, in the author's experience, has been to pot old plants in the fall and keep them in a cool house until midwinter and then bring them into a growing temperature; as the side shoots grow to a length of an inch or two, they are removed and rooted in the propagating bed with strong bottom heat. While of no value in North Carolina for market purposes at present, because of its unproductiveness, it is thought possible that the Loganberry may become the parent to better kinds in the hands of skillful improvers.

American vines; their adaptation, culture, grafting, and propagation, P. VIALA and L. RAVAZ (*San Francisco: California Wine Assoc., 1903, pp. 299, figs. 150*).—This is the second edition of this work. It has been translated by R. Dubois and E. H. Twight from the original French and issued as a California edition.

The work summarizes French experience in reestablishing their vineyards on American stocks. It discusses in detail the value of the different American species of grapes and hybrids as stocks for vinifera varieties on different soils and in different localities. An estimate is also given of the character and value of many vinifera hybrids. The concluding chapters deal with methods of culture, grafting, and nursery management. A bibliography of the writings of 72 authors is contained in the appendix. It is believed this book will be found especially useful to California vineyardists, as it shows the early mistakes of the French in the use of miscellaneous American stocks in reestablishing their vineyards destroyed by the Phylloxera, and clearly indicates the best methods, so far as known at present, in building up Phylloxera resistant vineyards.

On the budding of cacao, T. J. Harris (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 11, pp. 255–257*).—Detailed directions are given for budding cacao trees.

The Leeming system (*Planting Opinion, 8 (1903), No. 43, pp. 753–755*).—Under this heading a successful method of coffee culture observed in India is described. The chief characteristics of the system are a thinning out of the trees so that not more than 300 are grown per acre, and a total neglect of pruning and handling the trees. By preventing the trees from overcrowding the leaf disease, drying up at the end of the branches or ripe fruit, and inability to ripen crops are largely eliminated. The trees are not cultivated at all. Drains are dug to a depth of 3 ft. and at intervals of about 20 ft. throughout the orchard. For shade and fertilizer Erythrina is grown. Under this system a heavy crop of berries is secured only every other year; but the amount of fruit is stated to average up heavier than where a small crop is produced every year.

The culture of the Central American rubber tree, O. F. Cook (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 49, pp. 86, pls. 18*).—A discussion is given of the status, botany, and culture of Castilla rubber in Central America, with an account of methods of coagulating the latex, productiveness of Castilla, and the profits and prospects of Castilla culture.

It is shown that "a continuously humid climate is not necessary to the growth and productiveness of Castilla; the indications are rather that the quantity of milk and the percentage of rubber are both increased by an alternation of wet and dry seasons." Shade does not appear to be essential in Castilla rubber culture, plants thriving better in the open than in the dense forest. Experimental plantings of Castilla in Porto Rico and the Philippines are recommended. Gathering rubber from trees less than 8 years old is believed to be undesirable. Profits in rubber culture are not believed to be anywhere near as large as prospective investors have been led to believe. The indications are that Castilla is likely to produce rubber in paying quantities only at low elevations.

Castilla rather than the usual spelling Castilloa is believed to be the correct spelling for this species of rubber.

New caoutchouc from New Caledonia, R. Schlechter (*Tropenpflanzer, 7 (1903), No. 11, pp. 526–530, fig. 1*).—The author describes a new caoutchouc tree (*Alstonia dürckheimiana*), which he found during a botanical trip in New Caledonia.

India-rubber and gutta-percha, T. Seeligmann et al., trans. by J. G. McIntosh (*New York: D. Van Nostrand Co., 1903, pp. 412, pls. 3, figs. 86*).—This book treats very fully of the botany, culture, and preparation of these substances.

New species of gutta-percha from New Guinea, R. Schlechter (*Tropenpflanzer, 7 (1903), No. 10, pp. 467–471, fig. 1*).—The author discovered a tree in New Guinea from which a very satisfactory quality of gutta-percha was secured. German cable manufacturers believe that the material is suitable for their purposes and for other manufacturing uses. A botanical description is given of the plant, which has been given the species name of *Palaquium supfianum*, and illustrations of the different parts of fruit, flower, and leaves.

Modern progress in horticulture, F. W. Burbidge (*Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2, pp. 135–141*).—A paper on this subject, written largely from the florist's standpoint.

The daffodil; its root progress from planting to flowering, W. Bartholomew (*Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2, pp. 163–180, figs. 16*).—The author investigated the root development of 28 varieties of daffodils grown in soil and in water cultures. The root development made in these 2 media are illustrated for the different varieties and tabular data given showing the diameter of the bulbs used, date of planting, number of days before signs of rooting appeared, time from rooting to flowering, date of flowering, length of root when plumule first appeared, number of rootlets, etc.

Flower culture for distilling in southern France, A. Piatti (*U. S. Consular Rpts., 73* (*1903*), *No. 279, pp. 662–666*).—General notes on methods of culture, with statistics of production, and the prices paid in the Nice district during the years 1898 to 1903. The kinds of plants used in the preparation of essences are the Parme violet, acacia, jonquil, mignonette, roses, orange flowers, jasmine, tuberose, and carnation. Relative to the subject of rose geranium leaves for distilling purposes, it is stated that the annual production reaches about 3,300,000 lbs. One hectare (2.471 acres) produces 55,000 to 66,000 lbs. of leaves, which are sold at from $1.14 to $1.33 per 220 lbs. About 2.2 lbs. of pure essence is obtained from each 2,204 lbs. of leaves.

Manufacture of perfumes in Grasse, R. Guenther (*U. S. Consular Rpts., 73* (*1903*), *No. 279, pp. 666, 667*).—Notes are given on the extent of the perfume industry in the city of Grasse. The annual rose consumption for the purpose of perfume manufacture is estimated at about 2,650,000, and of orange flowers 660,000 lbs. The most important product in the region is the oil of neroli, which is made from flowers of the bitter orange. The so-called oil of roses is manufactured from the grass *Andropogon schœnanthus*. The oil of geranium is produced from flowers of *Pelargonium capitatum*. Other flowers used are jasmine, violets, tuberoses, jonquil, citronella, etc.

The lighter branches of agriculture, Edith Bradley and Bertha La Mothe (*London: Chapman & Hall, Ltd., 1903, pp. 346, pls. 20, figs. 42*).—This is Volume VI of The Woman's Library, edited by Ethel M. M. McKenna. Its purpose is to encourage women to engage in some of the lighter branches of agriculture. Different chapters treat of market gardening, fruit growing, dairying, poultry keeping, and bee keeping. In addition chapters are given on the marketing of produce and women's agricultural settlements. The subjects are discussed entirely from the English standpoint and do not apply, except in a very limited way, to American conditions. The chapter on dairying is perhaps most complete. The chapters on market gardening, fruit growing, and poultry keeping are largely rambling, general discussions, apparently intended rather to inspire than to direct.

FORESTRY.

Shade trees and other ornamentals, F. Garcia (*New Mexico Sta. Bul. 47, pp. 55, figs. 29*).—The planting of shade trees and shrubs in New Mexico is followed to but a limited extent, and the present bulletin is designed to give information regarding those that are available for planting in that region. Suggestions are given on the planting and care of trees, after which a number of species are described.

The author states that black locust, Russian mulberry, box elder, China berry tree, elm, ash, honey locust, and the common pear and apricot seedlings are all adapted to New Mexico conditions. Where a low-headed dense foliage is desired the southwestern species of elder and the Texas umbrella tree may be planted, and where irrigation water is abundant and rapid growth desired various species of

cottonwood may be employed. A number of evergreen shrubs and vines which are adapted to the region indicated are also suggested.

Ornamental and commercial tree planting (*Transvaal Agr. Jour., 1 (1903), No. 2, pp. 22–24*).—An interview with reference to the best method of planting the streets of country towns with suitable trees.

Tree planting for timber and fuel, C. B. McNaughton (*Agr. Jour. Cape Good Hope, 23 (1903), No. 4, pp. 415–431*).—An experiment in tree planting is being made by the municipal authorities of Oudtshoorn, South Africa. This planting is intended not only for a protection of the watershed on which the water supply is caught, but also for the production of timber and fuel. The scheme is highly commended not only for its economic advantages, but from the indirect benefit which is expected to accrue from the successful establishment of a large plantation of selected timber trees.

The author reviews the various conditions of temperature, soil, exposure, etc., and gives directions for the sowing of seed and planting out of trees. A considerable number of trees are described whose value for planting in this locality is believed to be assured and the different species are grouped according to their best uses.

Trees and tree planting in the upper districts of Natal, T. R. Sim (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 18, pp. 657–663*).—Attention is called to the fact that general directions for tree planting over a large area can not be given, as a number of factors must be considered. The different objects for which tree planting is practiced are described and a list of different trees adapted to Natal conditions is given. Most of the species described are of Australian origin, the author stating that European and northeastern American species have not proved altogether satisfactory when planted in that locality.

Progress report of forest administration in Baluchistan for 1901–2, C. B. Sen (*Forest Dept., Baluchistan, India, Rpt. 1901–2, pp. VI+22*).—This is a progress report on the management of the reserve forests in Baluchistan, together with the forest administration report of the Zhob Agency. This area amounts to about 203 square miles, and the question of reserving further areas is said to be under consideration. During the period covered by the report the natural reproduction of the forest was seriously interfered with on account of the extreme dryness of the season.

Brief reports are given on the artificial reproduction in which the value of walnut, ash, tamarisk, black locust, etc., is commented upon. Comparative tables are given showing the output from the different forests for the 3 previous seasons, a decided increase being noted in the output of timber and firewood for the season covered by this report.

The relation between the mountain pine and spruce in Jutland heath culture, P. E. Müller (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), Nos. 8, pp. 289–306; 10, pp. 377–396, figs. 10*).—It is claimed that through the mycorrhiza on their roots a sort of symbiosis is established between the mountain pine and spruce, which should be taken advantage of in forest plantings in Jutland, mixed plantations to be preferred over pure stands.

DISEASES OF PLANTS.

Studies in plant diseases, F. D. Chester (*Delaware Sta. Rpt. 1902, pp. 40–46, figs. 3*).—Brief notes are given on experiments in the treatment of pear canker, pear blight, a blight of currants, a blight of Japanese chestnuts and peach stock, and spraying tomatoes for blight. During the season covered by the report the author attempted to combat the pear canker, or body blight, by thorough application with a brush of a formaldehyde-glycerin mixture composed of formaldehyde (40 per cent) 1 part, glycerin 2 parts, and water 17 parts. This mixture was applied to cankered pear trees with such beneficial results that the author is inclined to recommend it as a treatment for pear canker. Continued experiments are to be conducted along this line.

During the latter part of April the author's attention was called to a milky fluid which was exuding from blighted limbs of pear trees. This fluid was examined and found to be swarming with bacteria. In order to test its virulence dilutions were made of some of this fluid and applied with a camel's-hair brush to pear blossoms. As a result the terminal growth of all shoots whose blossoms were inoculated showed the blight. The organism was separated, grown in pure cultures, and inoculation experiments conducted, in one of which the blight extended down the shoots 14 in. in 4 weeks. In another instance the diseased tissue was observed for 24 in. on the shoot, and all the leaves were blackened. Inoculations made on pear leaves showed that they were easily infected.

A peculiar blight of red and black currants was observed that was found to be due to some sterile fungus. The blight may show itself at any point on a live cane as a black discoloration of the bark around a spur. The cause of this disease is believed to be the same as that described in New York State Station Bulletin 167 (E. S. R., 12, p. 154). As remedial treatment the author suggests cutting out and burning all blighted canes and protecting the healthy ones by a thorough spraying with Bordeaux mixture.

A blight of Japanese chestnuts was investigated in which the cause was determined as a species of Cytospora, possibly *C. ceratophora*. All attempts to produce the disease by inoculation with spores have thus far been unsuccessful. A similar disease was observed on newly set peach trees, and inoculations made with masses of spores resulted in the destruction of the wood about the point of inoculation, but there was no marked spread from that place.

The experiments in the spraying of tomatoes for blight were performed on a plat of about one-fourth acre, the vines being given 2 applications of a 6 : 6 : 50 solution of Bordeaux mixture. The sprayed plants seemed fresher and freer from blight than the untreated ones, but the amount of disease on the unsprayed plants was so slight that little commercial benefit would have arisen from such an experiment.

Letters on the diseases of plants, N. A. COBB (*Agr. Gaz. New South Wales, 14 (1903), No. 8, pp. 681–712, pl. 1, figs. 26*).—Notes are given on banana scab, stigmonose, moldy core of apple, and quince rot.

The banana scab, which is described at considerable length, affects the fruit, rendering it unsightly and seriously impairing its quality. The author has separated a fungus which he believes to be the cause of the scab, but has not yet determined its botanical relationship. The banana scab can be prevented by spraying the plants with Bordeaux mixture, but care must be exercised not to discolor the fruit by the adherence of the fungicides. In addition to occurring on the bananas in Australia a scab disease of bananas from the Fiji Islands is reported.

The stigmonose disease described was due to insect punctures and is said to seriously affect apples and pears in Australia, rendering fruit of certain varieties unsightly and almost worthless. A shot-hole effect is produced on apricot leaves by attacks of several species of thrips, and the author has described this disease as the shot-hole stigmonose of apricot leaves.

The moldy core of apples is described as due to attacks of certain molds on a fruit, entrance being secured through the calyx end of the apple. Different varieties of apple are unequally affected, and a list is given of a number of species indicating their liability to infection.

The paper concludes with a brief description of quince rots caused by species of Alternaria.

A guide to fungus parasites, H. VANDERYST (*Rev. Gén. Agron. [Louvain], 12 (1903), No. 9, pp. 358–368*).—The present paper gives in condensed form descriptions of the Ustilagineæ, their characteristics, distribution in Belgium and elsewhere, host plants, and notes on their economic importance. About 20 species are enumerated.

Some injurious mildews on cultivated plants in German East Africa, P. HENNINGS (*Notizbl. K. Bot. Garten u. Mus., Berlin, 4 (1903), No. 32, pp. 80–82*).—

Brief notes are given on a number of parasitic fungi which have been observed in German East Africa, and descriptions are given of several which are considered as hitherto undescribed. Among those described are *Limacinia tangensis*, which has been found parasitic upon mangoes and also on the cocoanut palm, *Zukalia stuhlmanniana* on seedlings of the cocoanut palm and other species of palms, *Pleomeliola hyphaenes* on the leaves of Hyphaene, and *Asterina stuhlmanni* on pineapple leaves.

Precautions against rust of cereals, H. HITIER (*Jour. Agr. Prat., n. ser., 6 (1903), No. 40, pp. 435, 436*).—Attention is called to the influence of soil, fertilizers, rotations, time of seeding, etc., on the production of cereal rusts. In order to prevent their destructive occurrence the author recommends the selection of resistant varieties, early seeding, and proper fertilization of the crop.

A bacterial disease of rice, P. VOGLINO (*Turin: Derossi, 1902, pp. 48, figs. 11; abs. in Bot. Centbl., 93 (1903), No. 37, pp. 274, 275*).—An account is given of a disease of rice known as Brusone, in which the history, description of the disease, its pathology, etiology, and results of artificial inoculation experiments are included.

This disease, which has been known for some time, has been attributed to a great number of causes, such as climatic conditions, physical conditions of soil, various fungi, etc., all of which are reviewed by the author. From his observations he is led to believe that the disease previously described as due to *Pyricularia oryzæ*, is in reality caused, in many instances at least, by the bacteria which are found present in the discolored tissues and which he has called *Bacillus oryzæ*. He states that bacteria have recently been found in Japan accompanying this disease, and that what has been frequently attributed to the above-named fungus is really caused by the bacteria, the fungus occurring as a secondary agent.

The bacteria are found to develop with great rapidity in acid media, and as the roots seem to be the portion first attacked, the author recommends rendering the soils neutral or slightly alkaline by the addition of lime to them. All attempts to combat the disease by fungicides have failed, and at present the use of lime and the selection of resistant varieties seem to be the most practical means of combating the disease.

The specialization of Erysiphe graminis, E. MARCHAL (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 21, pp. 1280, 1281*).—In a previous publication (E. S. R., 14, p. 667) the author has given the results of his investigations with cross inoculation of the conidia of this mildew on certain grasses. He has continued his investigations and in the present paper reports experiments in cross inoculation with the ascospores of the fungus.

A number of cereals and grasses were inoculated, and as a result of the experiments it is claimed that no difference was observed between inoculations with the ascospores and where the conidia were employed. This is said to prove the specialization of the parasitism of this mildew, it having developed certain physiological races which are well established and which can not be carried from one host to another except within very definite limits.

Notes on the biology of Cystopus candidus, A. EBERHARDT (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 20–21, pp. 655, 656*).—A study was made of the biology of the white rust of cruciferous plants, and it was found possible to cross inoculate a number of host plants with the conidia of the fungus. There appeared to be no specialized forms of the organisms which were limited to certain genera or species of Cruciferæ. Similar investigations with the conidia of the form growing upon salsify showed that this species was confined to this and closely allied host plants.

Some observations on crown gall of apple trees, W. B. ALWOOD (*Virginia Sta. Bul. 140, pp. 187–212, figs. 11*).—Previous to 1896, the author states, there was practically no acquaintance in the State with the crown gall of apple trees, but the inspection work in connection with the San José scale showed that this disease was prevalent and since that date it has increased to an alarming extent.

Experiments are reported in which cuttings were made of diseased roots and stocks grafted upon them, the young plant being set out to determine the development of the fungus. Several varieties of apples were used in this experiment, and as a further experiment inoculations were made into grafts on healthy stock.

The author claims that the organism causing the crown gall gains entrance to the apple seedlings in the nursery. The diseased seedlings may be detected by inspection, the unusual abundance of fibrous roots at and below the crown being an indication of the presence of the disease. Care should be exercised to avoid the planting of such trees, as they will succumb sooner or later to the crown gall. The experiments reported show that the disease may be readily transferred to healthy stock; hence, diseased trees should not be allowed to remain among healthy ones in the orchard.

Inoculation experiments with Nectria ditissima, R. Aderhold (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 24–25, pp. 763–766*).—This is a critical review of a recent paper by Brzezinski,[a] which assigned the cause of apple canker to a new species of bacteria to which the name *Bacterium mali* was given. The author reports a number of inoculation experiments which seem to show that the true cause of canker of apple trees is *Nectria ditissima*, and claims that additional evidence will be required to establish the bacterial origin of this disease.

Fungus enemies of the peach, plum, cherry, fig, and persimmon, F. L. Stevens (*North Carolina Sta. Bul. 186, pp. 23–46, figs. 10*).—The more common and destructive diseases of peach, plum, and cherry are described and notes given for their prevention wherever definite means are known. Attention is also called to the fungus diseases of the persimmon and fig, and requests made that diseased material of these plants should be sent to the station.

The relation between Clasterosporium carpophilum and the gummosis of stone fruits, R. Aderhold (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 3, pp. 120–123, figs. 3*).—A discussion is given of the effect produced by this fungus on the fruit and leaves of cherries and other stone fruits, the material being condensed from a previous publication (E. S. R., 14, p. 776).

A new group of fungi, the Bornetineæ, L. Mangin and P. Viala (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 26, pp. 1699–1701*).—As a result of their studies on phthiriosis of the grape (E. S. R., 15, p. 165) the authors have established a new grouping to include the fungus *Bornetina corium*, the cause of the disease. This fungus has many affinities and the special group to which it is assigned is arranged provisionally between the Ustilagineæ and the Basidiomycetes.

The brunissure of the grape, L. Ravaz and L. Sicard (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 21, pp. 1276–1278*).—The authors have claimed that brunissure is the result of an overproduction of fruit, and they now report analyses of sound and diseased leaves, cuttings, and roots in which comparisons are made of the nitrogen, phosphoric acid, potash, lime, magnesia, and iron contents. The data indicate a considerable influence on the part of the disease in reducing the chemical composition of the tissues of the plant and also the quality of the fruit. In general, the diseased tissues are impoverished, their nitrogen, phosphoric acid, and potash being considerably reduced, while the lime and magnesia contents are higher. The authors conclude that fruit-bearing in excess drains the plant of its fertilizing principles and carbohydrates similarly to the action of parasites.

The black rot of the grape in North Carolina and its treatment, A. W. Edson (*North Carolina Sta. Bul. 185, pp. 133–156, figs. 10*).—The investigations on which this bulletin is based were conducted in cooperation between the U. S. Department of Agriculture, the State Board of Agriculture, and the North Carolina Station. After briefly describing the black rot and its effect upon the grape, the author describes the action of this disease as observed in North Carolina during 1902.

[a] Bul. Acad. Sci. Cracovie, 1903, Mar.

Experiments were conducted in 2 separate localities, and the time of appearance and subsequent reappearance of the fungus in an epidemical form is given. Considerable difference in susceptibility of varieties is noted, Delaware, Brighton, Catawba, Concord, and several others being but little affected, while Goethe and Salem grapes were badly diseased and Niagara was affected the worst of all. Most of the experiments were on the latter variety, although small blocks of other varieties were sprayed. The fungicide used was Bordeaux mixture, several different formulas of the preparation being used, and as a rule 6 applications were given the vines. In addition to spraying, the effect of inclosing the bunches of grapes in paper bags, picking off diseased leaves and berries, and the effect of fertilizers were investigated. The results of the different treatments are shown, together with the relative cost.

The experiments showed that ordinarily spraying with a 6:4:50 solution of Bordeaux mixture gave the best results, but in wet seasons, or during hot, wet, or muggy weather a stronger solution should be used. Bagging was found to protect the fruit from the fungus, but did not have the advantage possessed by the Bordeaux mixture of protecting the foliage and thus prolonging the growing season of the vines. The cost of spraying averaged $15.52 per acre.

The use of copper in combating gray rot of grapes, C. de James (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 46, p. 571*).—An account is given in which the author complains of the inefficiency of copper compounds as a means for the prevention of this disease. Applications were made of a mixture of triturated sulphur, sulphosteatite, and superphosphate, but after a brief period of rain the disease appeared with great destructiveness on both treated and untreated vines.

Powdery mildew and some grape hybrids, J. de Bouttes (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 45, pp. 547, 548*).—An account is given of the resistance of certain hybrids to powdery mildew. These hybrids have been produced at Flamarens, and represent the crosses of a number of different varieties. Some of the best hybrids are found to be the most resistant to the powdery mildew, as shown by their appearance at the close of the season. Where no fungicides had been used, one particular variety was found not only resistant to powdery mildew, but to the downy mildew as well.

The change in coloration of copper and sulphur fungicides after preparation, J. M. Guillon (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 24, pp. 1483, 1484*).—In a previous communication (E. S. R., 14, p. 669) the author called attention to the possibility of combating downy and powdery mildew of grape by applications of Bordeaux mixture and sulphur. This mixture simply holds the sulphur in suspension, and it is found that if not used immediately a decided change takes place in the color of the solution, which at length becomes nearly black. This change is the result of the formation of insoluble sulphur compounds. If this change does not take place it is an indication that the adherence of the compound has been diminished and that the solution should be used immediately after preparation.

A pepper vine disease, C. A. Barber (*Planting Opinion, 8 (1903), No. 35, pp. 618–621*).—The author describes some diseases to which pepper vines are subject, dividing them into 3 classes, one of which is called "canker," the second due to the attack of nematodes, while the third is caused by the presence of the mycelium of some fungus growing in the vessels of the plants to such an extent as to prevent their water conduction. Each of the diseases is briefly described and a suggestion is given for a possible prevention.

The dry-rot fungus, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), Nos. 3, pp. 89–104; 7, pp. 249–268, pls. 2, figs. 4*).—On account of its economic importance studies were made of *Merulius lacrymans*, the dry-rot fungus of timber. The occurrence and distribution of the fungus are commented upon, and investigations reported on the possibility of the fungus living parasitically in the living trees, its winter condition, spore formation, growth, and results of culture experiments.

A disease of plane trees, J. Beauverie (*Compt. Rend. Acad. Sci. Paris, 136 (1903), No. 25, pp. 1586–1588*).—A description is given of a disease of plane trees caused by *Glœosporium nervisequum.* This fungus, which is usually supposed to confine its attack to the leaves, has been found to infest the extremities of young branches and sometimes even the larger ones and the trunks of the trees. When attacking the stems and branches of the trees the fungus destroys the cambium and phloem and survives from year to year as a mycelium in the tissues of the host, appearing in the spring to spread to other plants. From this form it spreads directly to the leaves, and so severe has been the attack in certain regions that it is feared the planting of plane trees will have to be abandoned.

The "stagheadedness" of spruce, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 1, pp. 1–9, figs. 4*).—An examination was made of some of the causes of the frequent occurrence in spruce and other trees of "stagheadedness," by which is meant the death of one-third or more of the tops of the trees. This condition is of wide extent and has been attributed to various causes. The author seems inclined to the opinion that the preliminary injury is due to electric discharges through the trees, followed by attacks of bark beetles, fungi, etc.

The anatomical and pathological structure of stagheaded coniferous trees, C. von Tubeuf (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), Nos. 8, pp. 309–315; 9, pp. 367–372; 10, pp. 413–416, pls. 2, figs. 7*).—The anatomical and pathological structure of larch, spruce, pine, and other coniferous trees, as modified by the disease known as staghead, is described.

The leaf cast of Pinus cembra, H. C. Schellenberg (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 8, pp. 306–309*).—A discussion is given of the leaf cast of *Pinus cembra*, which is attributed to *Lophodermium pinastri.*

A disease of Phœnix, W. H. Taplin (*Amer. Florist, 21 (1903), No. 806, p. 587*).—A brief account is given of an attack of palm leaves by the fungus *Peronospora phœnixæ.* This fungus is often found upon a number of species of Phœnix, and renders the leaves unsightly as well as interfering with their functional activity. When specimens are badly affected the author recommends as a means of checking the further spread of the disease burning, or thorough applications of Bordeaux mixture of moderate strength to the infected foliage.

ENTOMOLOGY.

Report of the entomologist, E. D. Sanderson (*Delaware Sta. Rpt. 1902, pp. 109–151, pls. 6, fig. 1*).—Experiments were made with remedies for codling moth.

Trees in various parts of the State were sprayed with different arsenical insecticides, and the results indicated that arsenate of lead applied at the rate of 1 lb. to 50 gal. of water gave a larger percentage of perfect fruit than the arsenites of lime or soda, or Paris green or green arsenoid. All these arsenicals, with the exception of the arsenate of lead, were of about the same value. It was found to be unnecessary to make 3 applications provided the first 2 were properly done and the addition of adhesives to the arsenical sprays proved to be of doubtful value. The addition of kerosene to arsenical applications was made without harm to the trees. The benefit from the most successful spraying for codling moth was estimated at from 25 to 75 per cent.

Notes are also given on insect parasites of the codling moth, and on banding trees. About 4 per cent of the larvæ were captured by banding. Spraying experiments with various contact insecticides and fumigation with hydrocyanic-acid gas, Aphis Punk, Nikoteen, tobacco leaves, and Nicoticide were made in the control of plant lice, including *Aphis pomi*, *A. sorbi*, and *A. fitchii.* The best results were obtained by hydrocyanic-acid gas. The San José scale was successfully controlled by the use of the California wash and by summer applications of crude petroleum or kerosene. The kerosene was not as effective as crude petroleum. A number of Asiatic ladybird

beetles were received from the Division of Entomology of this Department, but their value in Delaware has not yet been determined.

In controlling the strawberry root louse the best results were obtained by burning over infested patches and by fumigating with hydrocyanic-acid gas or dipping in tobacco water. Whale-oil soap and kerosene emulsion injured a large number of the plants which were dipped into these solutions. Notes are also presented on the periodical cicada, harlequin cabbage bug, white-marked tussock-moth, fall webworm, strawberry weevil, apple-tree tent caterpillar, plum curculio, etc.

First annual report on the noxious insects of the State of Illinois, B. D. WALSH (*Bloomington: Illinois State Hort. Soc., 1903, 2. ed., pp. 140, pl. 1*).—In a preface to this edition, written by S. A. Forbes, it is stated that the report has long been out of print and that this edition is issued on account of the value of the material contained in the report. The subjects treated include grape curculio, grape-leaf gall-louse, rose bug, grape-root borer, codling moth, apple maggot, oyster-shell bark-louse, woolly aphis, plum curculio, plum moth, locusts, etc.

Report of the State entomologist, W. M. SCHÖYEN (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1902, pt. 1, pp. 110–153, figs. 21*).—As usual in these reports the entomologist presents descriptive biological and economic notes on the insects which were of most importance during the year in Norway. Among the numerous species discussed mention may be made of the following: Crane flies, frit fly, pea weevil, cabbage-leaf maggot, flea-beetles, cabbage butterfly, carrot fly, tarnished plant bug, apple weevil, pear-leaf blister-mite, *Argyresthia ephippella*, currant sawfly, *Bombyx pini*, and various other species injurious to pine and other cultivated trees and plants.

First report on economic zoology, F. V. THEOBALD (*London: British Mus. Nat. Hist., 1903, pp. XXXIV+192, figs. 18*).—This volume includes a large number of miscellaneous articles on economic zoology and is intended for use by the Board of Agriculture of London. The introduction was prepared by E. R. Lankester and contains a classification of animals into groups, from the point of view of economic entomology. The various ways in which animals affect man are mentioned, with examples of species under each group.

A large number of miscellaneous insects and other noxious animals are discussed under groups according as they are injurious to field crops, horticulture, trees, domestic animals, household materials, etc. Copies are also given of reports to foreign and colonial offices on the subjects of tsetse fly, white ants, locust plagues, etc., and a list is presented of North African locusts and white ants.

Hessian fly reared in the laboratory, F. L. WASHBURN (*Canad. Ent., 35 (1903), No. 11, p. 316*).—The author presents data obtained from breeding experiments with the Hessian fly in the laboratory and also from observations in the field. The possibility of a second brood of Hessian fly is suggested by these observations.

Remigia latipes, A. HEMPEL (*Bol. Agr. São Paulo, 4. ser., 1903, No. 7, pp. 314–320.*)—The caterpillars of this species are injurious to corn, millet, and other cultivated plants. Notes are given on the appearance of this insect in its different stages, on the means of distribution, natural enemies, and artificial insecticide treatment.

Insect and fungus enemies of the peach, plum, cherry, fig, and persimmon, F. SHERMAN, Jr. (*North Carolina Sta. Bul. 186, pp. 5–22, figs. 7*).—Notes on fruit-tree bark-beetle, San José scale, plum curculio, fig eater, peach-tree borer, peach-twig borer, black peach aphis, twig girdler, fall webworm, etc.

Fighting the San José scale insect in 1903, W. E. BRITTON and B. H. WALDEN (*Connecticut State Sta. Bul. 144, pp. 26, pls. 3*).—During the season of 1903 spraying experiments were made on about 11,500 trees, including peach, pear, and apple. The insecticides used were lime, sulphur, and salt; lime, sulphur, and copper sulphate; lime and sulphur; lime and potassium sulphid; whitewash; strong Bordeaux mixture; and a 25 per cent mechanical mixture of crude oil, all being applied to dormant trees, while kerosene soap emulsion was used upon growing trees.

The California wash was used more extensively than any other insecticide, and the lime-sulphur mixture and the lime and potassium sulphid proved about equally efficacious. Whitewash and Bordeaux mixture proved unsatisfactory. The Oregon wash was also less effective than the California wash. Crude oil is regarded as a very effective insecticide, but is considered somewhat dangerous in the hands of the average orchardist. Throughout the State nearly 40,000 trees were sprayed by orchardists with the lime-sulphur mixture with satisfactory results. This remedy adhered longest to the trees when applied just before the appearance of the leaves. Kerosene emulsion proved rather unsatisfactory as a summer treatment.

The treatment of orchards infested with San José scale, W. Newell (*Georgia State Bd. Ent. Bul. 8, pp. 20, figs. 2*).—The author briefly discussed the insecticide work which has been done by the Georgia State Board of Entomology since 1898. During this period various materials, washes, and patent insecticides have been tested, but none has proved satisfactory except oil treatments and lime-sulphur-salt wash.

In the use of oils the best results were obtained when they were applied in the form of emulsions. In February, 1903, a large orchard was sprayed with regular strength of lime-sulphur-salt wash, all trees being thoroughly coated. The results of this application are presented in tabular form. It appears that the lime-sulphur-salt is not immediately destructive to adult insects, but has the power for a considerable time of preventing the larvæ from establishing themselves. This insecticide also destroys the scaly covering and exposes the mature insects to the action of the weather and predaceous enemies.

Further experiments with lime-sulphur-salt wash were conducted in a number of other orchards and with uniformly gratifying results. In no instance was any injury done to the trees except where the wash was applied after the buds were beginning to open. Further experiments showed that this remedy could be applied as a summer treatment provided care was exercised not to cover the foliage and undergrowth. The lime-sulphur-salt mixture was believed to be more effective and safer than any of the emulsions and mixtures of oils. It is recommended that this remedy be applied in December and again toward the end of February or first of March.

The codling moth, C. B. Simpson (*U. S. Dept. Agr., Division of Entomology Bul. 41, pp. 105, pls. 16, figs. 19*).—The present bulletin is the final report of the author on his investigation of the codling moth of the Northwest. Previous preliminary reports have already been noted (E. S. R., 14, pp. 468, 536).

The subject of the codling moth is discussed in a general manner, the following topics being included in the bulletin: Systematic position of the codling moth, varieties, geographical distribution, means of spread, depredations, food habits, life history, and means of combating the insect. The author concludes that there are but 2 broods of codling moth per year in the arid parts of the West, and that the existence of a third brood is not yet proved. In controlling the codling moth spraying with arsenicals is recommended at 2 periods corresponding to the 2 generations of the insect. At the early period 2 applications should be made, 1 a few days after the petals fall and the other about 2 weeks later. In Idaho the second generation of larvæ begin to enter the apples about the last week in July and the third spraying is required at this period.

In addition to spraying, banding the trees and the destruction of larvæ in windfalls are recommended. The author concludes that by the use of proper preventive measures, such as spraying and banding for a period of years, the injury from the codling moth may be reduced from nearly 100 per cent to from 5 to 10 per cent. A bibliography of literature on the codling moth is appended to the bulletin.

When to spray for codling moth, G. Quinn (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 3, p. 140*).—The author recommends that the first spraying should be made when the young fruits are just formed, and the second 9 or 10 days later.

Other applications may be made at intervals of from 14 to 20 days. As an insecticide Kedzie's formula for arsenite of lime is recommended.

The peach-tree borer, C. L. Marlatt (*U. S. Dept. Agr., Division of Entomology Circ. 54, pp. 6, fig. 1*).—A revised form of Circular No. 17.

The depredations of Retinia turionana, together with notes on the life habits of members of this genus, J. Ritzema Bos (*Centbl. Bakt. u. Par., 2. Abt., 10 (1903), No. 8, pp. 241–250, figs. 2*).—Economic and biological notes are presented on *Retinia resinella, R. duplana, R. buoliana,* and *R. turionana.* The last-named species is very injurious to pines in Holland and elsewhere in Europe and notes are given on its injurious effects, manifested in the malformations of growing twigs of pines.

In controlling this species in the nursery or in young trees the author recommends that the larvæ be crushed in the infested buds, and that badly infested trees be removed. It is desirable that deciduous trees be planted around areas of conifers.

A study of insect metamorphosis, C. Pérez (*Bul. Sci. France et Belg., 37 (1903), pp. 195–427, pls. 3, figs. 32*).—The author made an elaborate study of the metamorphosis of *Formica rufa.* Notes are given on various details of gross and microscopic anatomy as observed during the different developmental stages of this insect. The literature of the subject is critically discussed in connection with a bibliography.

The cocooning habit of spiders, T. H. Scheffer (*Industrialist, 30 (1903), No. 6, pp. 88–93*).—Notes are given on the habits and life history of various species of spiders with special reference to the purpose and method of constructing cocoons. Several species of spiders were studied, including *Araneus trifolium, Argiope aurantia,* etc.

Millipedes and centipedes (*Bd. Agr. and Fisheries [London], Leaflet 94, pp. 4, figs. 3*).—Notes are given on the habits and life history of these animals and on the means of combating them. Since they are usually distributed in leaf mold and similar substances, it is recommended that such material be mixed with lime or that infested soil be treated with bisulphid of carbon.

The Trichodectidæ, M. Morse (*Amer. Nat., 37 (1903), No. 441, pp. 609–624, figs. 18*).—Notes are given on the feeding habits of the genus Trichodectes and a key is presented to assist in the identification of the 18 species which are recognized as occurring in North America. A brief list of literature relating to this genus is also presented. Detailed descriptive notes are given for each of the species.

The Diplopoda, P. Silvestri (*Classis Diplopoda. Portici: E. Della Torre, 1903, vol. 1, pp. 272, pls. 4, figs. 346*).—In this first volume of the author's account of the Diplopoda the anatomical structure of species of this group is described in detail, and the most important features are illustrated. Especial attention is given to the anatomy of the integument, muscles, and body segments.

Certain new cercomonadines, little-known parasites in the intestines of insects, L. Léger (*Arch. Protistenkunde, 2 (1903), No. 1, pp. 180–189, figs. 4*).—Notes are given on a number of protozoan organisms parasitic in the intestines of common insects, such as the house fly and species of Tabanus, etc. The parasitic organisms include *Herpetomonas muscæ, H. gracilis, H. lesnei,* and species of Crithidia.

The monthly bulletin of the Division of Zoology, H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 1 (1903), No. 4, pp. 32, pls. 2*).—Brief notes on plant diseases and insect pests of the month of August, carpet beetle, grain weevil, game birds, and weeds.

Report of the economic zoologist, B. F. MacCartney (*Pennsylvania State Dept. Agr. Rpt. 1902, pt. 1, pp. 171–178*).—A brief account is presented of the nursery inspection in connection with a list of the nurserymen of Pennsylvania.

Canadian law relative to imports of nursery stock, F. S. S. Johnson (*U. S. Consular Rpts., 73 (1903), No. 279, pp. 637–639*).—The attention of nurserymen is called to the inspection law of Canada relative to trees, plants, cuttings, buds, etc., liable to infestation by San José scale. Such shipments will be fumigated by the

Canadian government officials at the risk of the shippers or consignees. A list of plants exempt from fumigation is also given.

The use of hydrocyanic-acid gas in the control of insects, H. FAES (*Bul. Soc. Vaud. Sci. Nat., 4. ser., 39 (1903), No. 146, pp. 65–82*).—Attention is called to the disadvantages in the use of carbon bisulphid as compared to hydrocyanic-acid gas.

A number of experiments were made by the author in fumigating greenhouses which contained a large variety of plants of different hardiness, infested with scale insects and plant lice. The amount of cyanid of potash used per cubic meter of space varied from 2 to 5.25 gm., while the sulphuric acid and water were used at the rate of 4.5 cc. and 6.75 cc., respectively, for each 3 gm. of cyanid. The period of fumigation varied from 25 to 35 minutes. It was found on ventilating the greenhouse after fumigation that the gas had entirely disappeared within 15 minutes.

A list is given of the plants in the various greenhouses in which experiments were made. The insects which it was specially desired to kill were *Dactylopius adonidum* and *Aphis dianthi*. When cyanid was used at the rate of 3.5 gm. per cubic meter and the greenhouse was fumigated for 30 minutes, all species of scale insects, including the one just mentioned, were killed. Equally satisfactory results were obtained in the destruction of plant lice.

Observations were also made to determine the effect of the gas upon other animals. When the cyanid was used at the rate of 3.5 gm. per cubic meter, white mice and guinea pigs were killed within 5 minutes, and cats succumbed after 15 minutes. Frogs and salamanders were destroyed during a fumigation period of ordinary length. No injury was done to plants except when a large quantity of cyanid was used. The author considers that 5.3 gm. per cubic meter is too much and recommends for the fumigation of greenhouses a charge of 4.25 gm. per cubic meter.

Insecticides, C. L. PENNY (*Delaware Sta. Rpt. 1902, pp. 84–87*).—An analysis of a sample of arsenite of lime as prepared by a fruit grower showed that only 6.77 per cent of arsenious acid was present and that probably some of the acid was lost in boiling. The addition of sodium arsenite to Bordeaux mixture at the rate of 2 oz. per barrel was found to leave about 2.75 per cent of the total arsenious acid in solution. This quantity, however, is considered harmless in Bordeaux mixture.

When Paris green, Bordeaux mixture, and crude petroleum were shaken together it was found that after being allowed to stand for some time a greenish blue scum formed on the surface, consisting of petroleum, while a clear middle layer consisting of the clear portion of the Bordeaux mixture was formed, and a blue precipitate, consisting of the sedimentary portion of the Bordeaux mixture and Paris green, collected at the bottom. In mixing whale-oil soap, Paris green, and Bordeaux mixture it was found that the clear solution of soap was completely precipitated by the Bordeaux mixture, and that an insoluble lime soap was thus formed. Neither copper hydroxid nor Paris green was found to have any perceptible chemical effect on whale-oil soap when the latter was mixed and agitated with either of the former.

Remedies for insect and fungus pests of the orchard and farm, A. M. LEA (*Tasmania: Dept. Agr., 1903, 2. ed., pp. 53, figs. 30*).—This is an enlarged and revised form of the original edition (E. S. R., 14, pp. 466, 467).

A monograph of the Culicidæ or mosquitoes, F. V. THEOBALD (*London: British Mus. Nat. Hist., 1903, vol. 3, pp. XVI + 359, pls. 17, figs. 193*).—This is a continuation of the author's monograph on mosquitoes (E. S. R., 13, p. 770), and was issued for the purpose of including descriptions of new species and other interesting material which has been examined since the publication of the 2 previous volumes. More than 100 additional collections have been received and from these collections 88 new species and 8 new varieties have been found and described. Notes are given on the biology and life history of the more important species.

Soil nitrification v. the incidence of malaria and other mosquito-borne diseases, A. R. WADDELL (*Lancet [London], 1903, I, No. 23, pp. 1589–1590; abs. in*

Agr. News [*Barbados*], *2* (*1903*), *No. 35*, *p. 270*).—"The author states that one part of strong liquor ammoniæ in 4,000 parts of water is fatal to the mature mosquito larva, and concludes that the addition of nitrogen compounds to surface waters, through the medium of actively nitrifying soils, should prove an effective means of checking the multiplication of mosquitoes and of preventing malaria."

Bees and bee keeping, H. PILLAR, Jr. (*Rpt. Supt. Farmers' Insts. British Columbia*, *4* (*1902*), *pp. 37–40*).—A brief outline is presented of the operations which are necessary in the successful management of bees, including notes on drones, hives, swarming, honey plants, etc.

The use of bee escapes, E. BERTRAND (*Rev. Internat. Apicult.*, *25* (*1903*), *No. 10*, *pp. 201–203*, *figs. 2*).—A brief description of the mechanism of these devices and on the advantages of using them in the management of bees.

Means of ridding combs of the larvæ of drones, N. BARTHÉLEMY (*Rev. Internat. Apicult.*, *25* (*1903*), *No. 10*, *pp. 207, 208*).—The author calls attention to the desirability of examining the combs for the presence of male larvæ, and gives brief notes on practical methods for removing them from the comb.

Experiments with the glossometer, J. MAISTRE (*Rev. Internat. Apicult.*, *25* (*1903*), *No. 10*, *pp. 198, 199*).—The author made a number of measurements of the tongues of bees for the purpose of determining the possible effect of crossing Italian and native bees upon the lengthening of the tongues. The results are encouraging, but not yet conclusive.

Silk industry of the United States and of France, J. C. COVERT (*U. S. Consular Rpts.*, *73* (*1903*), *No. 279*, *pp. 625–628*).—Statistics are given on the value of silk fabrics produced in the United States and France and on the general conditions of this industry.

FOODS—NUTRITION.

Foods; their composition and analysis, A. W. and M. W. BLYTH (*New York: D. Van Nostrand Co.*, *1903*, *5. ed.*, *pp. 616*).—The authors state that this volume has, to a great extent, been rewritten, much new material being added to the text, as well as new tables and diagrams. Chapters on the detection and estimation of arsenic, the composition and analysis of spices, and the bacteriology of water constitute a part of the new material.

The microscopical examination of food and drugs, H. G. GREENISH (*London: J. and A. Churchill*, *1903*, *pp. 321*, *pls. 168*; *rev. in Public Health*, *16* (*1903*), *No. 2*, *p. 99*).—"The book is divided into 12 sections, dealing respectively with starches, hairs and textile fibers, spores and glands, ergot, woods and stems, leaves, barks, seeds, fruits, rhizomes and roots, with 2 appendices, one on the preparation of reagents and the other on the varieties of cell wall and cell contents."

Directions are given for preparing and mounting specimens, and much information is included regarding the foods, etc., described.

The acid content of bread or similar bakers' goods, A. SCHMID (*Jahresber. Thurgau. Kanton. Lab.*, *7* (*1902*); *abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *6* (*1903*), *No. 21*, *p. 1008*).—As shown by the results of 26 analyses of goods from 4 bakeries the acid content varied from 2 to 9 degrees. The acid content of 9 samples of grits varied from 2.5 to 3.7 degrees.

Analyses of bakers' goods, BALLAND (*Jour. Pharm. et Chim.*, *6. ser.*, *16* (*1902*), *No. 11*, *pp. 533–535*; *abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *6* (*1903*), *No. 21*, *p. 1009*).—Analyses are reported of a number of biscuits, cakes, and similar goods.

Concerning tropical flours and starches used as foods, BALLAND (*Jour. Pharm. et Chim.*, *6. ser.*, *17* (*1903*), *No. 10*, *pp. 476–478*).—Analyses are reported of apé starch (*Arum macrorhizum*), conophallus meal from tubers of an Amorphophallus, tavolo starch (*Tacca pinnatifida*), mapé starch (*Inocarpus edulis*), nété meal (*Parkia [illegible]*), arrowroot (*Maranta arundinacea*), banana meal, caryot starch (*Caryota [illegible]*), sago

starch (*Sagus rumphii*), talipot starch or raw palmirah root flour (*Corypha umbraculifera*), and bread-fruit flour.

Food stuffs made from cassava, BALLAND (*Jour. Pharm. et Chim., 6. ser., 17 (1903), No. 7, pp. 316–319*).—The author reports the composition of cassava meal, starch, tapioca, cassava cakes, and other products.

The utilization of rice and rice by-products (*Bol. Agr. São Paulo, 4. ser., 1903, No. 6, pp. 269–271*).—A descriptive article quoting analyses.

Sorghum flour (*Bol. Agr. São Paulo, 4. ser., 1903, No. 6, pp. 272, 273*).—The manufacture and uses of sorghum flour are described.

Banana flour, E. LEUSCHER (*Jour. Agr. Trop., 3 (1903), No. 28, pp. 304–306*).—Information regarding banana flour is summarized and briefly discussed.

Leuscher's method of preparing banana flour, J. NEISH (*Jour. Jamaica Agr. Soc., 7 (1903), No. 11, pp. 439–441*).—The method referred to is essentially as follows: Selected green bananas are plunged into water at 80° C. to facilitate peeling and after remaining in the water from 4 to 5 minutes are removed, peeled, and introduced into a vacuum dryer having a pressure of 700 mm. While drying the bananas are kept in motion by means of stirrers which alternate and move between fixed knives. The drying is completed in about 2 hours, after which the mass is passed through sieves with 120 meshes to the square inch. Any material which may remain is passed through a simple mill and sifted afresh. A banana flour of good keeping quality, it is said, contains about 15 per cent water.

The determination of the baking quality and value of East Prussian wheat, E. REISCH (*Fühling's Landw. Ztg., 52 (1903), Nos. 15, pp. 545–552; 16, pp. 576–585; 17, pp. 605–624; 18, pp. 654–670, figs. 5; 19, pp. 700–712, figs. 2*).—In the author's opinion laboratory methods for determining the baking quality of flour are better fitted to give reliable results than practical tests in a bakery. Using such methods an extended investigation was made with flours ground from East Prussian wheats.

The results obtained showed that there was considerable variation between winter and spring wheat grown on the same land, and between the crops of different seasons, the amount of rainfall, for instance, having a marked effect on the composition of the crop, and that such considerations must be taken into account in judging of the quality of the wheat from any given region. Other conclusions have to do with details of the methods followed.

Milk in powdered form (*Breeders' Gaz., 44 (1903), No. 18, p. 724*).—The method of manufacturing a desiccated and powdered product from skim milk, which it is claimed can be used in many ways as an article of diet, is briefly described.

Studies of the more important milk preparations in Switzerland with special reference to the chemical composition, germ content, coagulability, and the digestibility in vitro, F. SIDLER (*Arch. Hyg., 47 (1903), No. 4, pp. 327–406*).—From investigations made with a large number of samples of pasteurized, sterilized, and condensed milks prepared in Switzerland on a commercial scale the following conclusions were drawn:

All the milk preparations examined conformed to the requirements of the Swiss Food Control. On account of the heat employed in manufacture the amount of so-called soluble protein in all the samples, with the exception of one brand, was about one-third less than in normal unheated milk. One of the sorts of modified milk did not agree with its purported composition, doubtless because the heat employed in sterilizing had changed the ratio of casein to dissolved proteids. As shown by cultures, 28 of the 109 samples of bottled and canned milk examined contained bacteria, although in most cases no change could be noted in the milk. In Switzerland as in Germany "sterilized" milk is not always free from microorganisms.

The effect of hydrochloric acid upon the milk was found to vary with the degree of heat which had been employed and the method of manufacture. Coagulation

with rennet also varied with the degree of heat employed. Generally speaking, the higher the temperature the slower the rate of coagulation.

As shown by artificial digestion experiments, the different milk preparations varied little in digestibility, condensed milks being somewhat less thoroughly digested than the bottled goods. It was noted that the amount of hydrochloric acid used had a marked effect upon the digestibility of the sample, much more being digested when 1 per cent was added than with either 0.5 or 0.25 per cent. A bibliography is appended.

Holland's export meat trade, T. A. L. BEEL (*Ztschr. Fleich- u. Milchhyg., 13 (1903), No. 9, pp. 278, 279*).—The official regulations governing the export meat trade are quoted.

The sorghum beer of the Matabeles, H. NEUVILLE (*Jour. Agr. Trop., 3 (1903), No. 28, pp. 296–298*).—A descriptive article quoting an analysis by S. A. Pingstone. Among other topics the author discusses the character of the fermentation which takes place in the manufacture of sorghum beer.

Means for the prolongation of life, H. WEBER (*British Med. Jour., 1903, No. 2240, pp. 1445–1451*).—In addition to other matters the author discusses food and diet in relation to longevity. Moderation in eating and drinking is recommended, especially as old age approaches.

Observations on the digestion of proteids with papain, L. B. MENDEL and F. P. UNDERHILL (*Trans. Connecticut Acad. Arts and Sci., 11 (1901–3), pt. 1, pp. 1–14*).—The data reported have been noted from another publication (E. S. R., 14, p. 680).

The value of calorimetric examination, A. SCHLOSSMANN (*Berlin. Klin. Wchnschr., 50 (1903), No. 12, pp. 264, 265; abs. in British Med. Jour., 1903, No. 2234, p. 61.*)—The importance of determining the fuel value of food and excretory products for clinical purposes is pointed out.

The employment of the Berthelot bomb calorimeter for determining the existence of arsenic in the body, G. BERTRAND (*Ann. Inst. Pasteur, 17 (1903), No. 9, pp. 581–586*).—On the basis of experiments which are reported, the author recommends the determination of arsenic in the residue remaining in the bomb after combustion is completed as a suitable method for estimating this element in materials of animal origin.

Phosphorus metabolism by adult man, R. EHRSTRÖM (*Versamml. Nord. Naturf. u. Aerzt., Verhandl. Sek. Anat., Physiol. u. Med. Chem., 1902, pp. 87, 88*).—A brief account of an investigation included in a report noted from another publication (E. S. R., 14, p. 1100).

ANIMAL PRODUCTION.

Concentrated feeds, C. BÖHMER (*Die Kraftfuttermittel. Berlin: Paul Parey, 1903, pp. XII+650, figs. 194*).—This volume, which is designed as a practical handbook, takes into account the sources from which concentrated feeds are derived, their method of preparation, composition, digestibility, and uses, special attention being paid to the detection of adulteration and to microscopical analysis. The sections into which the book is divided are cereals and milling processes; microscopical examinations of feeding stuffs for the detection of adulterants and determining age; cereal grains, milling products, and by-products of fermentation; leguminous seeds and their by-products; by-products of oil making; and meat meals and condimental feeds. Weed seeds and a number of other topics are treated of in an appendix.

The valuation of feeding stuffs, C. KROMPHARDT, G. FAYE, ET AL. (*Ugeskr. Landm., 48 (1903), No. 23, pp. 249–253*).—According to the authors, the value of a concentrated feed is represented by the protein multiplied by 1.5, plus the fat multiplied by 2.4, plus the nitrogen-free extract, plus 0.5 times the crude fiber, digestible nutrients being considered in every case. The factor 1.5 represents the cost of nitrog-

enous components when the nonnitrogenous substances, according to average prices of different feeding stuffs in common use in Denmark, are assumed to be equal to 1. Protein is taken as equivalent to nitrogen multiplied by 6.25.—F. W. WOLL.

The nutritive value of feeding stuffs, G. FAYE (*Ugeskr. Landm., 48 (1903), No. 28, pp. 302, 303*).—In continuation of the above, the author advocates the use of isodynamic units for the comparison of the value of feeding stuffs, as follows: Protein plus 2.4 times the fat, plus nitrogen-free extract, plus 0.5 times the crude fiber.—F. W. WOLL.

Concerning the nutritive value of cellulose, B. USTYANTSEV (*Zap. Novo-Alexandri Inst. Selsk. Khoz. i Lyesov, 15 (1902), No. 2, pp. 101–191*).—In view of the great differences of opinion regarding the nutritive value of cellulose, the author undertook a series of investigations on the subject, using 2 sheep and 3 rabbits, studying with the sheep the effect of the influence of crude fiber on the metabolism of nitrogen and with the rabbits taking into account the metabolism of carbon as well. The respiratory products were studied by the method elaborated by Pashutine and his associates. The principal conclusions follow:

In the case of sheep the digestible crude cellulose exercised little influence on the cleavage of protein. When pentosans and pure cellulose were considered, the effect of the cellulose was more marked. Digestible crude cellulose, as well as pure cellulose and pentosans had a much smaller protein-protecting power than starch and sugar with both sheep and rabbits. In the case of rabbits, the experiments showed that the addition of cellulose to a ration practically free from it decreased the outgo of nitrogen in the urine. However, this was largely compensated for by the larger proportion of nitrogen excreted in the feces. Cellulose was found to protect fat from cleavage to a certain extent and, therefore, the author believes, may justly be called a nutrient.—P. FIREMAN.

The feeding value of whale-flesh meal, S. HALS and A. KAVLI (*Norsk Landmandsblad, 22 (1903), No. 30, pp. 395–397*).—Analyses of 27 samples of whale-flesh meals of different origin are given, together with figures for the digestibility of protein as determined by the Stutzer method, and for the ammonia content. The following table shows average results, the material designated No. 1 being a pure product, and No. 2 a product containing considerable quantities of bone, which it is stated might be properly considered as a whale guano:

Composition of whale flesh and whale-flesh meal.

	Water.	Protein.	Fat.	Ash.	Coefficient of digestibility of protein.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Whale-flesh meal, No. 1 (pure product)	7.28	62.27	25.07	4.78	71.4
Whale-flesh meal, No. 2 (meal with bone)	5.60	51.11	21.87	19.18	72.8
Fresh whale flesh	81.58	10.37	.86	.39	98.3

The relatively low figures for the digestibility of the protein of whale-flesh meal was attributed to the high temperatures employed in drying it. A low water content was accompanied by low digestibility and a small percentage of ammonia. In the case of 7 samples, containing on an average 5.6 per cent water, the average coefficient of digestibility of protein was 62.8 per cent and the average ammonia content 0.15 per cent, as compared with a digestion coefficient for protein of 76.7 per cent and an ammonia content of 0.39 per cent in the case of 15 samples containing on an average 8.24 per cent water.—F. W. WOLL.

Molasses in the feeding of farm animals, P. DECHAMBRE (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 19, pp. 438–445*).—A summary and discussion of work in this line.

Stock and poultry powders or condimental foods, D. O. NOURSE and M. FERGUSON (*Virginia Sta. Bul. 144, pp. 10*).—Microscopical analyses are reported of 23 kinds of condition powders, stock foods, condimental poultry foods, and similar goods. Without exception they were found to contain small amounts of such materials as charcoal, sulphur, alum, fenugreek, epsom salts, gentian, common salt, cayenne, and ginger, the greater bulk consisting of ordinary feeding stuffs such as ground wheat feed, corn meal, linseed meal, cotton-seed meal, gluten, etc.

The authors point out that the actual cost of manufacture must be small, probably not exceeding $40 per ton, while the cost to the consumer varied from $140 to $1,600 per ton. The use of these condimental feeds is discouraged.

"Whenever the condition of an animal is such as to require tonics or medicines of any kind, it is far better and much less expensive to employ a veterinarian to prescribe a treatment peculiar to its ailment, or when a veterinarian can not be had, the family physician can often advise a treatment which will be infinitely more reliable than an indiscriminate mixture which may have absolutely no value as a medicine."

Colonial products of animal origin, H. J. DE CORDEMOY (*Les produits coloniaux d'origine animale. Paris: J. B. Baillière & Son, 1903, pp. VIII+391, figs. 94*).—In this volume, which is largely made up of descriptive and statistical matter, the author discusses food materials and industrial products. Under food materials are included preserved meats and meat products, fish and fish products, edible birds' nests, etc. The industrial products include silkworms, fur-bearing animals, ivory, sponges, feathers, etc.

The digestibility of dry and moist albumen with and without the addition of meat extract, M. VOIT (*Ztschr. Biol., 45 (1903), No. 1, pp. 79–103*).—In experiments with dogs the digestibility of the dry matter, organic matter, and nitrogen of dry meat meal was much less than in the case of freshly extracted meat. The addition of meat extractives did not improve the digestibility of the meat protein. The bearing of the experiments on general questions of digestibility is discussed at length.

Decomposition of vegetable feeding stuffs by bacteria, J. KÖNIG (*Fühling's Landw. Ztg., 52 (1903), No. 9, pp. 322–326*).—The investigations here summarized have been noted from another publication (E. S. R., 15, p. 65).

Products formed by rotting barley, J. K. LERMER (*Ztschr. Gesam. Brauw., 1902, No. 25, p. 165; abs. in Hyg. Rundschau, 13 (1903), No. 18, pp. 948, 949*).—The author studied and measured the gaseous products formed from barley at different stages of decomposition.

Disembittering lupines, B. SHIRYAYEV (*Zap. Novo-Alexandri Inst. Selsk. Khoz. i Lyesov, 15 (1902), No. 2, pp. 193–197*).—Good results were obtained in removing the bitter matter from lupines by boiling them for an hour and then washing for 24 hours in running water at 8° C. Detailed analyses of the lupines before and after treatment are reported. The total loss of dry matter varied from 16.5 to 18 per cent, the losses consisting largely of the less valuable constituents rather than albumen.—P. FIREMAN.

Meat production in Queensland, H. DEXLER (*Ztschr. Fleisch- u. Milchhyg., 13 (1902–3), Nos. 3, pp, 65–72; 4, pp. 97–105, figs. 4*).—A descriptive article.

Information concerning common goats, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 42, pp. 14*).—The term "common goats" is used to include all mongrels, in order to distinguish them from Angora goats, which are a specific breed. Goat leather, according to the author, is always in demand, that of the common goats being useful for the manufacture of shoes and kid gloves, while that of the Angora is used for making morocco leather and to a considerable extent for the manufacture of heavy working gloves. In general, the longer the fleece the poorer the skin for leather making.

Statistics are quoted regarding the number of goats in the United States and imports of goat skins. The fact is emphasized that though the total number of goats kept in

the United States is large they are widely scattered and are seldom kept in large flocks, a fact which would render it difficult to secure any considerable number of common goats of desirable quality for breeding for leather.

The value of goat flesh, the use of these animals as destroyers of brushwood and as milk producers, as well as other topics connected with the industry, are discussed.

The high-bred sheep and swine industry of England and its importance for German breeders, E. A. Brödermann (*Schaf- und Schweine-hochzuchten in England und ihre Bedeutung für deutsche Züchter. Berlin: Deut. Landw. Gesell., 1903, pp. 20*).—Sheep and swine raising in England is discussed with special reference to its bearing upon similar industries in Germany.

Refrigeration as applied to bacon curing, L. M. Douglas (*Proc. Cold Storage and Ice Assoc., 4 (1903), No. 1, pp. 7–20, pls. 3*).—A brief paper with discussion.

Feeding stuffs for horses, P. Dechambre and E. Curot (*Les aliments du cheval. Paris: Asselin & Houzeau, 1903, pp. XVIII + 455, figs. 5*).—In this volume the authors discuss the composition of the body and the food requirements of horses, as well as the principal horse feeds and their nutritive and economic value, the whole constituting a useful summary of information on these topics. There are also chapters on poisonous feeding stuffs and veterinary medicine.

Cooperative records of the cost of producing eggs, H. H. Wing (*New York Cornell Sta. Bul. 212, pp. 48, fig. 1*).—In continuation of previous work (E. S. R., 14, p. 486) the station has cooperated with a number of practical poultry feeders for the purpose of obtaining data regarding the cost of the winter production of eggs under different conditions, the present investigation being in its essentials a duplicate of that reported earlier.

At the start the flocks included ranged in number from 43 to 700, exclusive of males. In every case some died or were removed during the test, which began December 1 and closed March 28, the time being divided into 4 periods, the second of 5 weeks and all the others of 4 weeks each.

"No restrictions were placed upon the owners as to how the fowls were to be fed, cared for, or managed. In brief, they were asked to produce, by their usual methods, the greatest possible number of eggs at the lowest possible cost and to report each week the kind and amount of food consumed and the number of eggs produced."

The average cost of feed per dozen eggs was 18.7 cts. and the average price of eggs 23.4 cts. per dozen. Considering this and the earlier test 29 flocks representing 10 owners and 5,200 fowls produced daily 22.8 eggs per 100 fowls, the average cost of feed per dozen eggs being 17.7 cts. The flocks which laid the most eggs during December and January also laid the most in March, and the hens which laid the most eggs produced them at the lowest cost per dozen regardless of the cost of the ration. The egg production of pullets was noticeably in excess of that of hens, particularly during the early part of the winter when the price of eggs was highest. The average cost of feed for 17 weeks was $35.33 per 100 fowls, and the average value of the product exceeded the cost of feed by $16.13 per 100 fowls.

A productive farmyard; ducks, swans, geese, and rabbits, L. Bréchemin (*La basse-cour productive: Palmipèdes et lapins. Paris, 1903, pp. 344, figs. 60; rev. in Jour. Agr. Prat., n. ser., 6 (1903), No. 44, p. 581*).—This volume, which is included in the *Librairie agricole de la maison rustique,* treats of the raising of ducks, swans, geese, and rabbits for profit.

Concerning the passage of fat from food to the egg, and concerning the fatty acids of lecithin, V. Henriques and C. Hansen (*Skand. Arch. Physiol., 14 (1903), No. 6, pp. 390–397*).—From some experiments with hens fed linseed products, and especially some in which hemp seed was fed, the conclusion was drawn that a considerable portion of the fat of food can pass into the egg unchanged. In this respect the egg fat is comparable in formation with body fat rather than milk fat.

Studies were made of lecithin from various animal sources and other fatty acids than stearic, palmitic, and oelic were identified, a fact which is not in accord with commonly accepted theories. The fat of the lecithin molecule, the authors believe, has a different structure from that found in other animal fats and is constant, being independent of the kind of animal or the character of the fat in the feed.

Concerning the formation and composition of chicken fat, A. ZAITSCHEK (*Arch. Physiol.* [*Pflüger*], *98* (*1903*), *No. 11–12, pp. 614–622*).—The effect of feeding milk on the composition of chicken fat was studied, one hen being given maize and milk and the other maize only. Cramming was resorted to in order that large amounts might be eaten. The conclusion was drawn that feeding whole milk induced the formation of a body fat which was similar to butter fat in composition except that no volatile fatty acids were formed. The nitrogen, phosphoric acid, and ash in the flesh of the 2 hens were determined in addition to the fat.

DAIRY FARMING—DAIRYING.

Dairying as a factor in the profitable utilization of farm lands, A. T. NEALE (*Delaware Sta. Rpt. 1902, pp. 7–39*).—A brief description is given of the dairy herd under observation and of its management.

During the calendar year 1902, 13 cows were in the herd. The total yield of 10 cows of the herd was 39,987 lbs. of milk, containing on an average 4.9 per cent of butter fat. At creamery prices for butter fat the income from this source amounted to $520.06.

Five calves were sold for veal for $47.20, and 4 heifers were reserved for breeding purposes, their value being placed at $41.25; 2 other calves died during an experiment with a calf food. The skim milk was fed to pigs, the detailed data from the experiment being given. An actual balance of $28.24 was credited to the skim milk. Considerable explanations are entered into concerning the small returns from this source, and the feeding of the pigs is discussed at some length. The avoidable losses and wastes in this experiment, amounting to $56.05, were attributed largely to the failure to combine rational feeding with practical care and attention.

The total income from the herd of 10 cows was therefore $636.82, the cost of purchased feed was $91.80, and the cost of the 68 tons of silage produced and used for this purpose was $101.75. Notes are given on the production of the silage. The allowance for pasturage of the cows was $53.62, and for labor and attendance $152.80. The total expense for food and labor was therefore $399.97, to which was added $32.23 interest at 6 per cent on the capital invested. The net profit from the herd during the year was $204.62, or $20.46 per head. The land used in pasturing the herd was estimated as returning a net profit of $11.34 per acre, and that upon which the silage crops were grown a net profit of $16.36 per acre. The nature of the capital involved is stated, the silo used is described, and the construction and value of silos in general is discussed (see p. 623).

Had the milk been sold to a condensed milk factory instead of to a creamery, the skim milk being fed to heifers and pigs, the total income as estimated would have been $622.93 in place of the $636.82 which was received. Furthermore, had the milk been sold to the wholesale market of Philadelphia, the income as estimated would have been $618.74; the conclusion being drawn that under the conditions of the experiment the creamery afforded the most satisfactory market.

Investigations on the cattle of "Cowland," E. FRANK (*Mitt. Landw. Inst. Univ. Breslau, 2* (*1903*), *No. 3, pp. 511–558*).—The region referred to is located in the northern part of Austria, and includes portions of Moravia and Silesia. A description is given of the region and of the cattle, together with considerable data relating to the different types of cows.

Feeding experiments with linseed cake, K. H. M. VAN DER ZANDE (*Verslag Ver. Exploit. Proefzuivelboerderij, Hoorn, 1902, pp. 14–22*).—Linseed cake having an

unusually high percentage of acid decreased slightly the amount of milk produced. For practical purposes the author believes that the factor of acidity may be neglected.—H. M. PIETERS.

The cow-protector "Simplex" (*Norsk Landmandsblad, 22 (1903), No. 19, pp. 240–242, fig. 1*).—A simple Swedish device for keeping cows clean in the stable. A broad piece of sail cloth is attached behind the cows and suspended so the droppings falling thereon do not come in contact with the animal or the bedding.—F. W. WOLL.

Methods of milking, with special reference to the manipulation method, F. W. WOLL (*Pennsylvania State Dept. Agr. Bul. 113, pp. 96, figs. 23*).—The author discusses the structure of the cow's udder and the secretion of milk; describes the various methods of milking, paying particular attention to the Hegelund method, and gives the results of tests previously noted from another source (E. S. R., 14, p. 694).

On the art of milking (*Landtm. Månadsbl., 1903, No. 7, pp. 107–110*).

The lime content of the udder, M. TOYONAGA (*Bul. Col. Agr. Tokyo Imp. Univ., 5 (1903), No. 4, pp. 455–457*).—In continuation of earlier work on the relation of lime to magnesia in animal tissues, the author determined the lime and magnesia in the udder of a cow. The water content of the specimen was 66.7 per cent. The lime content of the dry substance (as CaO) was 0.25 per cent and the magnesia was 0.06 per cent. The calcium content was higher than that reported by other investigators in the case of the spleen and muscle, while the content of magnesium was much lower than in these tissues.

Influence of stimulating substances upon milk secretion, G. FINGERLING (*Jour. Landw., 51 (1903), No. 3, pp. 287, 288*).—The influence of malt sprouts and fenugreek was studied with a sheep, and of hay extract and fennel with a goat. Some variations in the yield and quality of the milk were attributed to the different substances. Fennel in particular increased both the yield of milk and the percentages of fat, sugar, proteids, and ash.

The fat content of cows' milk, VANDERPLANCKEN and A. J. J. VANDEVELDE (*Repr. from Handel. Zesde Vlaamsch Natuur- en Geneesk. Cong., Kortrijk, 1902, pp. 8*).—Data obtained at a creamery during 3 years showed that the highest percentage of fat occurred during the months of December, January, and February.—H. M. PIETERS.

On variations in the fat content of cows' milk, L. FUNDER (*Tidsskr. Norske Landbr., 10 (1903), No. 4, pp. 168, 169*).—A discussion of the various factors that influence, or are believed to influence, the fat content of cows' milk.—F. W. WOLL.

The relation of temperature to the keeping property of milk, H. W. CONN (*Connecticut Storrs Sta. Bul. 26, pp. 16*).—This bulletin emphasizes the importance of low temperatures in keeping milk. In an experiment referred to in the discussion as an extreme case, the bacteria in milk multiplied 5-fold in 24 hours when the temperature was 50° F., and 750-fold in the same time when the temperature was 70°. Milk kept at 95° curdled in 18 hours, at 70° in 48 hours, and at 50° in 148 hours. So far as the keeping property of milk is concerned, low temperature is considered of more importance than cleanliness.

In milk kept at 95° the species developing most rapidly is the undesirable one known as *Bacillus lactis aerogenes*. At a temperature of 70° this species develops relatively less rapidly in the majority of cases than *B. lactis acidi*, which latter is very desirable in both cream and cheese ripening.

"The bacteria in milk kept at 50° increase slowly, and later consist of very few lactic organisms but of miscellaneous types, including many forms that render the milk unwholesome. These bacteria continue to grow slowly day after day, but the milk keeps sweet because the lactic organisms do not develop abundantly. Such milk in the course of time becomes far more unwholesome than sour milk, since it is filled with organisms that tend to produce putrefaction. . . .

"Although the temperature of 50° is to be emphatically recommended to the dairyman for the purpose of keeping his milk sweet and in proper condition for market, he must especially be on his guard against the feeling that milk which is several days

old is proper for market, even though it is still sweet and has not curdled. Quite the reverse is the case. Old milk is never wholesome, even though it has been kept at a temperature of 50° and still remains sweet and uncurdled. This very considerably modifies some of our previous ideas concerning milk, for it has been generally believed that so long as the milk remains sweet it is in good condition for use. Quite the contrary is the case, if it has been kept at a temperature of 50° or in this vicinity. It is not unlikely that it is this fact that leads to some of the cases of ice-cream poisoning so common in summer. The cream is kept at a low temperature for several days until a considerable quantity has accumulated or a demand has come for ice cream, and when made into ice cream it is filled with bacteria in great numbers and of a suspicious character."

The author also discusses briefly other means of improving the keeping property of milk, such as the proper care of cows and stables, the use of covered milk pails, the cleansing of dairy utensils, straining, and aeration.

The Casse pasteurizer, A. SJÖSTRÖM (*Nord. Mejeri Tidn., 18 (1903), No. 21, pp. 281, 282, fig. 1*).—Report of trials made at the station for trials of agricultural machinery at Alnarp, Sweden.—F. W. WOLL.

Trials of regenerative pasteurizers at Alnarp Dairy Institute, A. SJÖSTRÖM (*Nord. Mejeri Tidn., 18 (1903), No. 20, pp. 273–275, figs. 2*).—The following pasteurizers were tried: C. Holmberg, Paasch & Larsen, Petersen, and Rudelius & Boklund.—F. W. WOLL.

Bacteriology of milk, H. SWITHINBANK and G. NEWMAN (*London: John Murray, 1903, pp. 605, pls. 33, figs. 35, charts 3, map 1*).—A vast amount of information relating to dairy bacteriology is presented in this extended and excellent treatise. The opening chapter deals with some general considerations, such as the properties and composition of milk, milk secretion, and milk as a medium for bacteria; following which is a detailed discussion of technique.

A chapter treats of the examination of air and water in their relation to milk supply. Three chapters are devoted to the bacterial content of milk, fermentation in milk, and economic bacteria in milk and milk products. The tubercle bacillus is taken as a type of pathogenic bacteria in milk, and this subject is discussed at length. Other pathogenic bacteria in milk and the investigation and prevention of milk-borne epidemics are also fully considered. Descriptions are given of a large number of species of bacteria which have been claimed to have an important relation to milk, butter, or cheese. The species are arranged in alphabetical order, no attempt being made at classification. The concluding chapters are devoted to the control of the milk supply by the State, by private enterprise, and by the trade.

A series of appendixes contains milk regulations, forms of contract for supplying milk, etc. The footnotes throughout the volume serve as a valuable bibliography to the wide field of literature reviewed. American work is frequently cited. The book is well printed and illustrated, and will undoubtedly prove very useful to those interested in this subject, especially in its relation to preventive medicine.

Tallow-like butter due to the influence of light, A. LIDOW (*Vyestnik Shirov. Veshch., 4 (1903), p. 151; abs. in Chem. Ztg., 27 (1903), No. 81, Repert., p. 253*).—Butter subjected to the influence of artificial light was found to change in color from yellow to white and to develop the taste and smell of tallow. Analytical data are reported.

Influences affecting the content of fatty acids in butter, K. H. M. VAN DER ZANDE (*Verslag Ver. Exploit. Proefzuivelboerderij, Hoorn, 1902, pp. 45–72, dgms. 4*).—Reference is made to previous work along this line, and feeding experiments made during the fall and winter of 1902–3, are reported. Four lots of 5 cows each were used. Lot 1 was kept on plain pasture as long in the fall as possible. Lot 2 was also pastured late, but was fed in addition after October 7, a special food consisting of sirup mixed with finely ground cornstalks. Lot 3 was stabled early and fed freshly cut grass. Lot 4 was also stabled early, but was fed hay and linseed cake

The severe weather occurring while the cows were still on pasture decreased apparently the content of fatty acids. The author also concludes that the special food rich in sugar lessened but did not entirely overcome the bad effects of exposure. No decisive results were obtained as regards the feeding of grass as compared with hay and linseed cake. It is believed, however, that there is no advantage in stabling and feeding linseed cake over late pasturing, provided the pasturage is abundant and the weather not too severe.

The results of an experiment with parsnips are considered as indicating that these roots have a prompt and pronounced effect in increasing the content of fatty acids in butter.—H. M. PIETERS.

The "butterini" of Sorrento, C. A. NEUFELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 14, pp. 637–640, fig. 1*).—"Butterini" or "mantecchi," a peculiar product made in Sorrento, is described. This consists of a gourd-shaped yellow cheese of which the interior is filled with butter. The composition of the cheese and butter, fresh material, and that 3 months old, is reported.

Bacteriological examination of the "butterini" of Sorrento, W. RULLMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 14, pp. 640, 641*).—A bacteriological study of the product mentioned above.

Cheese problems, J. MICHELS (*Michigan Sta. Spec. Bul. 21, pp. 10, figs. 2*).—Several series of experiments are briefly reported and discussed. Milk testing 3, 3.5, 4, 4.5, and 5 per cent of fat made respectively 8.24, 9.53, 10.35, 11.41, and 12.74 lbs. of cheese per 100 lbs. of milk; showing an increase in the yield of cheese corresponding closely to the increase in the fat content of the milk.

Coating cheese with paraffin gave results very favorable to this practice. The growth of mold was almost completely prevented, the loss due to shrinkage was greatly lessened, and the loss in rind was reduced from 11.56 to 3.14 per cent. The net economy in this treatment was estimated at 14 to 15 cts. per 100 lbs. of cheese. In paraffining cheese it was found desirable to heat the paraffin to 240–250° F. by means of a gasoline burner, and to omit the use of cloth as the paraffin adhered better to the cheese itself. It is stated that paraffin having a melting point of 130 to 135° is best suited for this purpose. About ¼ lb. of paraffin is required for a cheese weighing 44 lbs. Cheese should be coated within 12 hours after leaving the press. The apparatus used at the Michigan Station is illustrated.

Stirring the curd by hand for ½ to 1 hour and then salting was compared with matting, milling, and salting after 1 hour, according to the usual Cheddar process, the conditions in both cases being uniform until after the removal of the whey. One cheese in each case was cured in cold storage at 38° and 1 in an ordinary curing room at 60°. "More water can be incorporated in cheese when the curd mill is used and the curd matted than by the stirred process, but a water content of over 38 per cent is objectionable even in a quick-curing cheese. Cheese with a moderately high water content will cure better at 60 than 38°; but where the water content is excessively high or where the milk has a bad flavor, 38° is recommended as a ripening temperature rather than 60°."

In the manufacture of sage cheese satisfactory results were obtained by the addition of sage tea to the curd, 6 or 7 oz. of sage being required for the curd from 1,000 lbs. of milk. The most satisfactory method, however, was the addition of the finely powdered leaves to the curd just before salting; the amount of sage required being about one-half as much as when the extract is used.

Notes are given on the prevention of gassy curd by the use of starters.

Rennet enzym as a cause of chemical changes in the proteids of milk and cheese, L. L. VAN SLYKE, H. A. HARDING, and E. B. HART (*Jour. Amer. Chem. Soc., 25 (1903), No. 12, pp. 1243–1256*).—This article is essentially the same as Bulletin 233 of the New York State Station (E. S. R., 15, p. 399).

Report of the dairy instructor, G. S. THOMSON (*Rpt. Min. Agr. South Australia, 1902–3, pp. 26–37*).—This is an account of dairying in Europe as observed by the author

in a visit to the principal dairy countries, with suggestions for the improvement of the dairy industry in South Australia.

Modern dairying (*Quart. Rpt. Kansas State Bd. Agr., 22 (1903), No. 87, pp. 288, figs. 68*).—This is made up of a series of short popular articles reprinted from various sources. In the introduction brief statements are made concerning the present status of dairying in Kansas.

VETERINARY SCIENCE AND PRACTICE.

Infection and immunity with special reference to the prevention of infectious diseases, G. M. STERNBERG (*New York and London: G. P. Putnam's Sons, 1903, pp. XI+293*).—The purpose of this volume is to treat in a systematic way the main facts of infection and immunity, in so far as they may be made available in the control and eradication of infectious diseases. No attempt is made to discuss controversial matters relating to recent investigations and bearing upon the various theories of immunity. Special emphasis is laid upon the general proposition that infectious diseases are preventable and attention is called to the means of checking infection.

The subjects of disinfection by heat, sunlight, gases, and various chemicals is treated at some length. The discussion of specific diseases is confined largely to those which affect man, but special mention may be made of the chapters on tuberculosis, tetanus, and hydrophobia.

The theory of natural antibacterial immunity, P. T. MÜLLER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 5, pp. 458–463; 6, pp. 550–556; 7, pp. 700–713*).—The literature of this subject is critically reviewed in connection with experiments made by the author for the purpose of determining the basis of immunity in animals. Attention is called to the fact that the production of antibodies takes place very rapidly within a few hours after infection and that the tissues which are primarily affected by the disease are directly concerned in the production of these bodies. The antibodies arise first at the point of infection and later appear in other organs.

The author's experiments were made on pigeons which were artificially infected with a number of pathogenic organisms. Some of the pigeons were purposely starved and others were well fed during the progress of the experiments. It was shown by these experiments that defective nutrition and the consequent disturbance of metabolism exercises a pronounced influence upon the production of agglutinins. Different species of bacteria, however, did not react in the same way to the effect of nutrition on the infected birds. The typhoid bacillus and *B. pyocyaneus* uniformly developed a higher content of agglutinins in animals which had been partly starved than in those which were well fed, while *B. proteus*, *B. dysenteriæ*, and cholera vibrio behaved in the opposite manner. The withholding of food and other harmful interference with the normal course of animal metabolism have the power of influencing the production of antibodies which are associated with bacterial substances in a manner which is determined by the nature of the bacteria used in the experiment.

The study of the origin of alexins, U. LAMBOTTE (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 5, pp. 453–457*).—The author's experiments were made on horses, dogs, and chickens. The blood plasma of all these animals acted in the same way toward the cholera vibrio, and the action of the serum and plasma was almost identical. The author believes that the bactericidal alexin, as well as the hemolytic alexin, comes from the organized elements of the blood.

Artificial immunity against staphylococci, PRÖSCHER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 5, pp. 437–445*).—Experiments carried on by the author indicated that normal goat serum has the power of agglutinating a portion of the staphylococci in a given culture, but does not affect the rest. Notes are given on methods of estimating the power of the immune serum of goats and horses with regard to the action of such serum upon staphylococci.

From the peritoneal cavity of animals treated with normal serum an exudate was taken 3 minutes after inoculation with staphylococci, and it was found that all of the micro-organisms had been surrounded by large mononuclear leucocytes; a few polynuclear cells had assisted in this process. It appears from these experiments that staphylococcus serum exercises a stimulating influence upon the multiplication of the leucocytes.

An attempt to explain the purpose and action of intermediary bodies, H. ZANGGER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 5, pp. 428–437*).—A study of toxins showed that these substances ordinarily react slowly in comparison with chemical reactions. Notes are given on toxins and various other substances obtained from the blood serum and various tissues. The author calls attention to the importance of the agglutinins and precipitins in the study of immunity. The similarity of intermediary bodies and ferments is shown by comparison of their various properties in detail.

On the question whether tetanolysin forms a nontoxic product in combination with the proteids of the serum of egg albumin, P. T. MÜLLER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 6, pp. 567–573*).—The experiments reported in this article were made with the serum of horses and steers. The results obtained indicate that precipitated and dissolved albumins, even in large doses, fail to exercise a pronounced check upon the development of tetanus. The alcoholic extract of the serum, however, showed a strong antihemolytic power. It appears, therefore, that the property antagonistic to tetanus is not precipitated in the albumins, but remains soluble in alcohol, and is therefore necessarily different from the serum proteids.

The author concludes, therefore, that the control of hemolysis and the apparent antitoxic action observed in the treatment of tetanus are not truly antitoxic, but pseudo-antitoxic phenomena due to physical and chemical processes brought about during the solution and distribution of the bodies concerned in the development and control of the disease.

A bacterial toxin with acute action, R. KRAUS (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 6, pp. 488–496*).—Experiments were made with cholera vibrio obtained in 1899. The experimental animals were rabbits. It was found in experiments with this toxin that death was produced in rabbits within 24 hours after intravenous inoculation in moderate doses. The toxin exercised a hemolytic and other injurious actions which proved rapidly fatal in all cases.

It is concluded as a result of these experiments that evidence is thus obtained for the existence of a bacterial toxin which acts in a rapid manner without a period of incubation, and in that respect resembles snake virus. An antitoxin which operates in neutralizing this toxin exists in the normal blood serum of certain animals. This antitoxin, however, exercises its neutralizing action at a comparatively slow rate.

The action of bacteria upon the hemoglobin of the blood, M. LABBÉ (*Arch. Méd. Expér. et Anat. Path., Paris, 1. ser., 15 (1903), No. 3, pp. 364–378*).—A study was made of the changes produced in the blood of laboratory animals during infection with various organisms, such as anthrax bacillus, cholera bacillus, diphtheria bacillus, etc. The changes in the blood were studied by means of a spectroscope. The various micro-organisms with which the author experimented are classified in different groups according to the effect which they were found to exercise upon the hemoglobin.

It was found that the slight irritation and transformation of hemoglobin into methemoglobin are due to the action of bacterial secretions, and these phenomena should not be confused with the intense irritation of oxyhemoglobin, which is directly connected with the life of the micro-organisms.

An attempt at a new theory of bacteriology, A. P. FOKKER (*Versuch einer neuen Bakterienlehre. The Hague: Nederlandsche Boek- en Steendrukkerij, 1902, pp. 50,*

pls. 2).—The author presents a condensed summary of his various publications relating to the nature of bacteria, including an account of experiments with the anthrax bacillus undertaken for the purpose of determining the behavior of this bacillus on various culture media. When this organism was introduced into water containing various quantities of salt a considerable proportion of the bacilli were killed within a short period. Certain differences in resisting power were observed in colonies which had been cultivated on different media.

The author presents arguments of a general nature and based on his experiments, in favor of the proposition that bacteria are not necessarily the only cause of the infectious diseases in which they are found, and that the spontaneous generation of various species of bacteria, including the anthrax bacillus, is possible and is frequently observed.

Pathogenic molds and mucormycoses in animals and man, G. J. BARTHELAT (*Arch. Parasit.*, *7* (*1903*), *No. 1*, *pp. 5–116*, *figs. 63*).—A detailed critical review is given of the literature of this subject in connection with a bibliography. A considerable variety of species of molds have been found to be pathogenic to animals and man, and descriptive and biological notes are given on all these species. In the second part of the paper attention is given to the spontaneous and experimental occurrence of mucormycoses.

The author made numerous experiments for the purpose of ascertaining the pathogenic properties of species of molds, and as the result of his studies came to the following conclusions: Mycoses naturally fall into 2 groups according as they are produced by a species of Aspergillus or Mucor. The species of which the virulence for animals has been determined are *Mucor corymbifer*, *M. ramosus*, *M. truchisi*, *M. regnieri*, *M. pusillus*, *Rhizomucor parasiticus*, etc. Animal tissues attacked by pathogenic molds are modified in a characteristic manner. The infection by molds may be secondary and follow a primary infection by some species of bacteria.

The internal use of arsenic and iodid of potash was found useful in the treatment of nearly all forms of infection from pathogenic molds. When the spores of these molds were introduced into the veins of rabbits, guinea pigs, or chickens, the death of the animal was brought about within a short time, the duration of the disease depending upon the species of mold and the quantity of spores used. Not all internal organs are equally affected by pathogenic molds. These organisms seem to exhibit a decided preference for the kidneys, mesenteric ganglia, intestines, and striated musculature.

In acute cases the lesions in the kidneys are specially well marked in the convoluted tubules where the pathogenic mold is found in abundance. Subcutaneous inoculation of spores of these molds produced merely a reaction in the number of leucocytes, while intratracheal injection was without effect except in the case of birds. Ingestion of the spores was likewise without effect, the whole digestive tube remaining without any lesion. Diseases caused by pathogenic molds are not directly contagious.

The behavior of the pleuroperitoneal epithelium in surrounding foreign bodies during the process of healing, J. G. MÖNCKEBERG (*Beitr. Path. Anat. u. Allg. Path.*, *34* (*1903*), *No. 3*, *pp. 489–531*).—The experimental animals employed by the author were rabbits and guinea pigs. Intraperitoneal inoculations of lycopodium spores were made and the effect of these spores upon the peritoneal epithelium was studied. It appeared that during the process of healing the first demonstrable change consisted in the loss of the epithelial layers and the simultaneous appearance of a coagulable exudate and hematogenous wandering cells belonging to the type of polymorphous leucocytes. It was observed that during degenerative processes following inflammation the epithelial cells of the serous membranes undergo a process of proliferation and become motile more quickly than the connective tissue elements of the serous coats.

Report of the State veterinarian, L. PEARSON (*Pennsylvania State Dept. Agr. Rpt. 1902, pt. 1, pp. 99–170*).—During the year a diminution in the prevalence of tuberculosis, anthrax, and blackleg was noted, while a slight increase was observed in glanders, hog cholera, and rabies. A disease of cattle frequently referred to as "mountain disease," and popularly supposed to be due to poisonous plants, was shown to be hemorrhagic septicemia identical with that observed in Minnesota, Wisconsin, etc.

Notes are given on the methods of immunization of cattle against tuberculosis by the use of attenuated cultures. During the year about 60,000 doses of tuberculin, together with large quantities of mallein and anthrax vaccine were made and distributed. Papers on the intercommunicability of human and bovine tuberculosis, by M. P. Ravenel, and on the immunization of cattle against tuberculosis, by L. Pearson and S. H. Gilliland, are reprinted (E. S. R., 14, pp. 609, 610). Notes are also presented on anthrax, blackleg, hemorrhagic septicemia, abortion, ergotism, forage poisoning, glanders, Texas fever, rabies, hog cholera, and foot-and-mouth disease. A copy is also given of a law for the prevention of rabies, authorizing quarantine and muzzling of dogs.

Infectious diseases; their etiology, diagnosis, and treatment, G. H. ROGER, trans. by M. GABRIEL (*New York and Philadelphia: Lea Brothers & Co., 1903, pp. VI + 874, figs. 43*).—While this volume treats primarily of human diseases, a large proportion of the text is occupied with a discussion of the general characters of pathogenic bacteria, the etiology and pathogenesis of infections, the reactions of the organism to pathogenic bacteria, and the general subjects of immunity and predisposition to infectious diseases. An elaborate review is presented of the subject of tuberculosis in mammals, birds, and cold-blooded animals, and the relationship of tuberculosis in animals and man.

Infectious diseases of our farm animals, W. H. DALRYMPLE (*Proc. Nat. Live Stock Assoc., 6 (1903), pp. 220–230*).—Notes are given on the usual means by which various animal diseases are spread from place to place. The most important cattle diseases are mentioned and notes are given on methods which may be adopted for preventing their universal distribution. Attention is called to the importance of observing all possible sanitary precautions and applying disinfection after outbreaks of contagious diseases.

Certain diseases of animals and their relation to those of man, E. WIENER (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 9, pp. 653–723*).—The diseases to which the author devotes especial attention in this article are tuberculosis, anthrax, glanders, bubonic plague, and rabies. The agency of rats in carrying plague is briefly discussed. Statistics are given on a number of cases of anthrax in various domestic animals and man in the German Empire during the year 1900, and the literature relating to disinfection after the occurrence of anthrax is briefly discussed.

The author notes also the conditions under which glanders may be transmitted from animals to man and presents statistics on the prevalence of rabies in the German Empire. The greater portion of the article is occupied with an elaborate review of the tuberculosis question and the conclusion is reached that tuberculosis of man and animals is one and the same disease. Notes are also given on botulism and other forms of ptomaine poisoning.

Animal diseases, G. D'UTRA (*Bol. Agr. São Paulo, 4. ser., 1903, No. 8, pp. 351–374*).—The author describes the symptoms and pathological anatomy of nagana, surra, mal de caderas, and dourine. Notes are also given on the differential diagnosis of these diseases and on the insects which are concerned in their transmission.

Medico-veterinary observations for the province of Verona for the years 1898–1900, F. BRUNI (*Atti e Mem. Accad. Agr., Sci., Let., Arti e Com. Verona, 4. ser., 3 (1902–3), pp. 1–41*).—Notes are given on the more important diseases of man, especially tuberculosis, which prevailed during these 3 years, together with an

account of the chief animal diseases for the same period. The epizootics most prevalent during that period were foot-and-mouth disease, anthrax, hog cholera, rabies, and glanders. The distribution and prevalence of these diseases are shown in a series of tables.

Medico-veterinary observations in 1901, F. BRUNI (*Atti e Mem. Accad. Agr., Sci., Let., Arti e Com. Verona, 4. ser., 3 (1902–3), pp. 342–384*).—The important animal plagues are briefly discussed and their prevalence is shown in tabular form. These plagues include rabies, glanders, hog cholera, tuberculosis, anthrax, and foot-and-mouth disease.

Annual report on investigations in the field of veterinary medicine, ELLENBERGER ET AL. (*Jahresber. Leist. Geb. Vet. Med., 22 (1902), pp. 277*).—The authors present a list of the various periodicals which have been examined in the preparation of the abstracts of veterinary literature. Author and subject indexes are also given. The main body of the report is occupied with brief abstracts of the literature which appeared during 1902 on various veterinary subjects, including infectious diseases, tumors, parasites, sporadic diseases, anatomy, histology, zootechny, animal dietetics, etc.

The origin and comparative anatomy of malignant tumors, R. DISSELHORST (*Berlin. Tierärztl. Wchnschr., 1903, No. 5, pp. 61–65*).—A brief review is given of the various theories which have been held regarding the nature and origin of malignant tumors. The author believes that a special susceptibility toward certain tumors may be inherited. It appears also from the investigation of these tumors in animals that the older animals are considerably more susceptible than young animals. The frequency of the occurrence of various forms of tumors in horses, dogs, and cattle is shown in a tabular form.

The law of Darbot and modification of the laws relating to veterinary police officers, F. ROLLIN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 41, pp. 472–474*).—In the author's opinion the present law regarding the control of animal diseases is too slow of operation and involves delays which frequently result in the unnecessary spread of highly infectious diseases, such as pleuro-pneumonia.

Experience in the use of Ichthargan, BERNHARDT (*Berlin. Tierärztl. Wchnschr., 1903, No. 6, pp. 77–79*).—According to the statements of the manufacturers of this product it contains 30 per cent of silver, it is readily soluble in glycerin, and in the author's experiments exhibited a bactericidal power considerably superior to that of nitrate of silver.

Ichthargan was used in the treatment of a number of diseases both externally and internally. It was found possible to administer the drug internally as a powder in milk. This use of Ichthargan proved beneficial in the treatment of mammitis in mares. The drug was also administered intravenously in cases of vaginitis with good results. In the treatment of vaginitis it was administered intravenously and also as a vaginal wash. The author believes that Ichthargan is superior to all other silver products with which he has experimented.

The first international conference on tuberculosis, PANNWITZ (*Berlin: Cent. Internat. Bureau for Prevention of Tuberculosis, 1903, pp. 461*).—A report of the proceedings of the international conference on tuberculosis held at Berlin October 22–26, 1902. The various papers which were presented and the discussions are reproduced in German, French, and English.

The proceedings of the conference included an inaugural meeting, at which general topics were discussed, and meetings of the general council, at which papers were presented relating to a review of measures for the prevention of tuberculosis and special reports on methods of repression as practiced in various countries. At this session also the means of furthering the propaganda for the suppression of tuberculosis were discussed. At the second meeting of the general council the following subjects were discussed: Obligatory notification, polyclinics and dispensaries, work-

shops, and means of collecting sputum. Attention was also devoted to the various methods of caring for human consumptives.

One meeting of the general council was devoted to a discussion of human and bovine tuberculosis (pp. 295, 296). At this meeting papers were presented by Köhler, Nocard, Arloing, De Schweinitz, Schroeder, and von Behring on the question of the unity of the various forms of tuberculosis. All of these speakers except Köhler came to the definite conclusion that tuberculosis of man and cattle is one and the same disease and may be transmitted from man to animals, or vice versa. Köhler expressed the opinion that the question of the unity or duality of tuberculosis was not yet satisfactorily determined.

The warfare against tuberculosis, M. P. Ravenel (*Proc. Amer. Phil. Soc., 42 (1903), No. 173, pp. 212–219*).—A discussion of the problem of tuberculosis from the viewpoint that the disease is transmissible, preventable, and curable in its early stages. The relationship between the human and bovine bacillus is discussed and notes are given on the most important method of repression of animal tuberculosis and on the recent methods for producing immunity by means of serum therapy and otherwise.

Modifications of the human tubercle bacillus, J. Auclair (*Arch. Méd. Expér. et Anat. Path., Paris, 1. ser., 15 (1903), No. 4, pp. 469–488*).—A series of experiments was undertaken by the author for the purpose of testing the possible modifications to which human tubercle bacillus was susceptible when cultivated on various nutrient media. Detailed descriptions are given of the appearance of this organism when cultivated on bouillon, agar, potato, gelatin, and other media. The morphological characters and staining reactions of bacilli treated by different methods are also compared.

Inoculation experiments were made on rabbits and guinea pigs by subcutaneous, peritoneal, intratracheal, and intravenous methods. For these experiments the homogeneous form of the bacillus was used. During these experiments it was found that by cultivation on various media and especially by the use of artificial devices, such as agitation, the tubercle bacillus could be transformed into a saprophyte. In this form the bacillus grows on ordinary media in the form of a homogeneous culture. Growth is rapid. The bacillus is motile, strictly aerobic, ferments lactose, liquefies gelatin, and takes ordinary stains.

When this form of the organism is inoculated into animals it is found to have lost its virulence and infectiousness, but is still slightly toxic. The toxin of the homogeneous form of the tubercle bacillus is quite different from the tuberculin of a virulent form of the bacillus and when inoculated into animals does not cause pneumonia, caseation, or sclerosis.

Notes on the article of Krompecher and Zimmermann concerning the virulence of tubercle bacilli, Vagedes (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 6, pp. 507, 508*).—A controversial article occupied with a discussion of the possibility of variation in the virulence of the tubercle bacillus.

The action of the tubercle bacillus in experimental pulmonary tuberculosis, G. Herxheimer (*Beitr. Path. Anat. u. Allg. Path., 33 (1903), No. 3, pp. 363–408, pls. 2*).—The problems connected with a general study of tuberculosis are briefly outlined by the author. Experiments were made for the purpose of studying the behavior of the tubercle bacillus in cases of pulmonary infection. In these experiments the bacilli were injected directly into the lungs or by the intratracheal method. Fresh culture of tubercle bacilli in glycerin-bouillon were used.

The experimental animals were rabbits and guinea pigs. In some cases the bacilli were introduced in a dry form into the trachea. The experimental animals were killed at periods varying from ½ hour to 7 weeks after inoculation and microscopic preparations were made for further study. Detailed notes are given on the pathological findings of this investigation. According to the results obtained by the author

the tubercle bacillus passes down the trachea and arrives in the alveoli. During this passage it exercises considerable chemotactic action upon the polynuclear leucocytes in the walls of the bronchi.

As soon as the bacilli arrive in the alveoli they are surrounded by the alveolar epithelial cells and exercise a destructive influence upon the elastic fibers. The epithelial and connective tissue elements undergo considerable proliferation in the presence of the tubercle bacillus. Wherever the bacilli occur in large quantities the neighboring tissue is entirely destroyed and an accumulation of polynuclear leucocytes takes place. These in turn become destroyed, and round cells appear on the periphery of the tubercle.

Comparative investigations on tubercle bacilli of different origin, H. KOSSEL, A. WEBER, and HEUSS (*Tuberkulose-Arb. K. Gesundheitsamte, 1904, No. 1, pp. 1–82, pls. 4*).—The literature of this subject is discussed in connection with a bibliography of 194 titles. The plan of the experiments reported in the paper included the following features: The collection of the largest possible number of human tubercle cultures from different cases and from different tuberculous organs; inhalation experiments with virulent cultures of human tubercle bacilli in calves 3 to 6 months old; feeding experiments with similar cultures repeated daily for a period of 3 months in calves 3 to 6 months old and pigs 5 to 8 weeks old; one or repeated passages of slightly virulent human tubercle cultures through goats, and subsequent inoculation of calves 3 to 6 months of age with cultures thus treated; hypodermic inoculation of calves 3 to 6 months old with fresh cultures of bovine tubercle bacilli; inhalation experiments with similar cultures and with the same experimental animals; feeding experiments during which calves and pigs were fed daily for a period of 3 months milk containing bovine tubercle bacilli. Detailed notes are given concerning the cultures obtained for these experiments. Inoculation experiments with rabbits, cattle, and other experimental animals showed that hypodermic inoculations of cultures which came from tuberculous organs of cattle and hogs produced almost without exception c generalized tuberculosis in cattle and led to fatal results within 6 to 8 weeks in one-half of the cases. Experiments with tubercle bacilli from fowls indicated that this form of the bacillus was not capable of producing a progressive tuberculosis in the organs of cattle. In the majority of cases human tubercle bacilli were found to be distinguishable—from morphological, cultural, and pathological standpoints—from bovine tubercle bacilli. In a few cases, however, human and bovine tubercle bacilli appeared not to be distinguishable. The authors consider the bearing of these results upon the question of the treatment of tuberculous milk and meat, and conclude that the possibility of infection of man by tuberculous products must be admitted, but that this infection takes place with comparative infrequency.

Tuberculosis of fowls, A. WEBER and H. BOFINGER (*Tuberkulose-Arb. K. Gesundheitsamte, 1904, No. 1, pp. 83–158, pl. 1*).—The authors present a critical review of the literature of this subject, in connection with a bibliography of 183 titles. A series of experiments was made for the purpose of gaining additional information concerning the identity or nonidentity of mammalian and avian tubercle bacilli. The authors maintain that the identity of the organisms has not been shown in a single unexceptionable case. No indication was found from their own experiments, or from the literature of the subject that fowls suffer from tuberculosis of the ovaries, and it is therefore concluded that infection is not transmitted by means of the egg, but chiefly in the feces. The authors' experiments were made largely with 11 original cultures of avian tubercle bacilli. Detailed notes are given on the morphology and cultural characters of these organisms. Inoculation experiments were made with fowls, rabbits, guinea pigs, and mice, by the feeding, intravenous, hypodermic, and inhalation methods. The results of the authors' investigations may be summarized as follows: The avian tubercle bacillus, as a rule, shows morphological and cultural characters, which distinguish it clearly from the mammalian tubercle bacillus. Occasionally,

however, the organisms appear to be identical in these respects. It appears that under natural conditions tuberculous infection in fowls takes place through the alimentary tract. The avian tubercle bacillus is pathogenic to some extent for rabbits, mice, and guinea pigs. In guinea pigs, however, the progress of the disease is quite limited. The tubercle bacilli obtained from fowls retain their original pathogenic properties unchanged after passage through the body of mammals. In the authors' experiments these organisms could be recognized readily after being cultivated in guinea pigs and mice for a period of from 1 to 2 years. A typical culture of mammalian tubercle bacilli was obtained from the organs of a parrot affected with tuberculosis. The authors also succeeded in obtaining a typical culture of avian tubercle bacilli from the caseified mesenteric glands of a pig, which otherwise showed no symptoms of tuberculosis. Under natural conditions, therefore, the authors were unable to find any tendency of the mammalian tubercle bacilli to become modified into the avian form in the body of fowls, or of the avian bacillus to become modified into the mammalian form in the body of mammals.

Tuberculosis in cats, W. LELLMANN (*Berlin. Tierärztl. Wchnschr., 1903, No. 7, pp. 111, 112*).—The author presents details concerning the symptoms and pathological anatomy of 2 cases of tuberculosis in cats. An examination of the blood showed a great diminution in the number of red blood corpuscles, so that the ratio of red to white blood corpuscles was 50:1. The mesenteric glands were enlarged and innumerable small white tubercles were found in the spleen and liver. The bronchial and mediastinal glands were also tuberculous and enlarged.

Attenuation of the mammalian tubercle bacillus in cold-blooded animals, H. HERZOG (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 6, pp. 535–539; 7, pp. 675–685, pl. 1*).—The literature of this subject is reviewed in connection with a brief bibliography. The author's experiments were made on frogs, fish, and other cold-blooded animals. Detailed notes are given on the methods of cultivation of the tubercle bacilli and the staining of affected tissue.

The inoculation of guinea pigs with mammalian tubercle bacilli after an extended sojourn in the organism of cold-blooded animals indicated that the mammalian tubercle bacillus preserves its virulence for at least 190 days when inoculated into cold-blooded animals. It was apparent during these experiments that the guinea pigs succumbed to reinfection by tubercle bacilli treated in this manner more slowly than by bacilli taken freshly from infected mammals. Distinct lesions were produced in cold-blooded animals by inoculation with bacilli of mammalian origin.

A supplemental series of experiments was carried out for the purpose of determining the effect of a sojourn in cold-blooded animals upon bacilli obtained from tuberculous calves. Inoculation of guinea pigs was made after the bacilli had been allowed to remain in frogs for periods of 62, 90, 140, and 191 days. These experiments also showed that the guinea pigs succumbed to infection more slowly, the longer the organism had been allowed to remain in frogs.

The tubercle bacillus of the turtle; its culture, biology, and pathogenic action, F. F. FRIEDMANN (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 7, pp. 647–658; 8, pp. 793–804, pl. 1*).—Tubercle bacilli were isolated from cases of pulmonary tuberculosis in turtles and pure cultures were readily obtained. The growth and behavior of the organism on various culture media are described. The organism was found to grow luxuriantly at a temperature of 37° C., but some growth took place at various temperatures ranging from zero to 43°.

The bacillus obtained from turtles was readily distinguished from that obtained from other cold-blooded animals by the appearance of the cultures, and especially by its rapid growth at 37° C. Detailed notes are given on the morphology of this organism and on the changes of form which take place in cultures of different ages. A number of inoculation experiments were made on turtles of several species, snakes, blind worms, lizards, frogs, carp, chickens, doves, dogs, rats, white mice, rabbits,

and guinea pigs. The organism was found in all investigated species of cold-blooded animals, with the exception of carp, multiplied rapidly, and showed a wide distribution in these species.

Turtles died of miliary tuberculosis within periods ranging from a few weeks to a few months after intraperitoneal or intrapulmonary injections. Similar conditions were observed in other cold-blooded animals. Birds, dogs, rats, and white mice were resistant to the organism. Guinea pigs, however, when inoculated with large doses, died within 4 to 8 days and exhibited tuberculous formation in the peritoneal cavity, especially in the omentum. In cases in which guinea pigs lived for 12 to 14 days after inoculation true tubercles were formed. When small doses were used for inoculation of guinea pigs the tuberculous processes ultimately healed and entirely disappeared.

During these investigations it was found that cultures of tubercle bacilli obtained from turtles and grown at a temperature of 37° C. were absolutely indistinguishable from human tubercle bacilli.

The appearance of pseudo-tubercle bacilli in cattle, P. MOELLER (*Berlin. Tierärztl. Wchnschr., 1903, No. 10, pp. 156, 157, figs. 2*).—A study of a number of cases of tuberculosis in cattle showed that while the pseudo-tubercle bacilli may be present in the secretions and excretions, or even in the diseased organs of tuberculous cattle, they can not be considered as having any etiological connection with the disease.

The acid-resistant bacilli of butter, milk, and soil compared with the tubercle bacillus, P. COURMONT and M. POTET (*Arch. Méd. Expér. et Anat. Path., Paris, 1. ser., 15 (1903), No. 1, pp. 83–128, pl. 1*).—The subjects discussed in this article include a general history of acid-resistant bacteria, their habitat, cultures, morphology, staining characters, biological characters, and pathogenic action. A considerable variety of these organisms has been found in butter, milk, fertilizers, forage, soil, and elsewhere.

As a result of the authors' experiments, it is concluded that while under ordinary circumstances it is comparatively easy to differentiate between tubercle bacillus and other acid-resistant bacteria, none of the tests are universally applicable. Nearly all of the acid-resistant bacteria can be obtained in sufficient virulence to produce typical tubercles when inoculated into experimental animals. The pathogenic power of the tubercle bacilli, on the other hand, may be completely destroyed by cultivation under certain conditions. The possibility of relationship between the various forms of acid-resistant bacteria is suggested.

Lesions in the central nervous system produced by tetanus toxin, A. ZINNO (*Arch. Méd. Expér. et Anat. Path., Paris, 1. ser., 15 (1903), No. 3, pp. 335–363, fig. 1*).—The author conducted a double series of experiments, in the first of which portions of nervous tissue were prepared according to the methods of Courmont et al., and in the second of which greater care was exercised in preventing any contamination of the portions of the nervous system used in the experiment.

After animals were inoculated with tetanus toxin obtained from portions of the nervous system they were killed at various periods and a microscopic study was made of the nervous system. The experimental animals were dogs, guinea pigs, rabbits, and pigeons. These animals were inoculated with doses of different sizes, but always from a very virulent form of the bacillus.

As a result of these experiments it is concluded that the injection of tetanus toxin in ordinary experimental animals produces characteristic clinical symptoms which correspond with the nervous lesions. The lesions are observed in the chromatophilous cells, simultaneously in the centrosome and nucleolus. The neuroglia and nerve fibers are little affected except in advanced stages of the disease. In certain cases a secondary infection will spread rapidly to other organs and to other parts of the nervous system than those in which the primary attack appeared.

Meningo-encephalitis in rabbits, P. MISCH (*Arch. Path. Anat. u. Physiol. [Virchow], 172 (1903), No. 1, pp. 158–174*).—Detailed notes are presented on the course and outcome of a number of cases of this disease in rabbits. The scanty literature of the subject is critically reviewed. Abscesses were found in the cerebellum, with evidences of fresh suppuration. These lesions in the brain caused the various abnormal movements of affected animals. An exudation was observed upon the surface of the brain.

Cocci were isolated from the cerebro-spinal fluid and cultivated under artificial conditions. Rabbits inoculated intravenously with bouillon cultures of this organism died within from 1 to 3 weeks with symptoms identical with those observed in cases of spontaneous infection.

An attempt to explain the susceptibility of rabbits to anthrax, O. BAIL and A. PETTERSON (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 5, pp. 445–452; 6, pp. 540–550*).—A detailed study was made of the blood of rabbits for the purpose of detecting the presence of any property in normal blood which could explain the known susceptibility of these animals to anthrax.

As the result of these experiments it is concluded that the marked destruction of anthrax bacilli by rabbit serum in vitro does not take place in the body at all, or at least only under special conditions. The reason for this difference in the action of the serum in and out of the body is that the intermediary body contained in the serum while the blood is in contact with the organs of the body is always united with the cell receptors in accordance with Ehrlich's theory.

The affinity of the intermediary body for the cell receptors is greater than that for the anthrax bacilli. As a result of the intermediary body, a complement of a bacteriolytic nature becomes associated with the cell receptors, so that the bactericidal complement contained in the serum is without effect, on account of the absence of a suitable intermediary body. In view of these facts it is readily understood why the anthrax bacillus is not checked in its development inside the body of rabbits.

The incineration of anthrax carcasses, L. FABRITIUS (*Berlin. Tierärztl. Wchnschr., 1903, No. 4, p. 50*).—Attention is called to the desirability of burning bodies of animals dead of anthrax in order to prevent the further spread of this disease. In burning such bodies the author recommends that the carcasses be dumped into ditches in such a manner that no material which may escape from the effect of the heat will be in a position where it is likely to cause reinfection of other animals with anthrax.

Contagious malignant vaginitis of cattle with special reference to the necrosis bacillus, ELLINGER (*Berlin. Tierärztl. Wchnschr., 1903, No. 2, pp. 25–29*).—The literature of this subject is critically reviewed. Contagious vaginitis, in the author's experience, is usually associated with inflammation of the udder, calf diarrhea, and abortion. The author observed a large number of cases in cows, all of which occurred soon after parturition. The cause of this disease, according to the author's investigations, is the necrosis bacillus, which is found in abundance in the vaginal secretions.

Notes are given on the pathological anatomy, differential diagnosis, and course of the disease. The treatment recommended by the author consists in thorough and repeated irrigation of the vagina with a 2 per cent solution of lysol or creolin, together with the use of tampons saturated with Lugol's solution. In preventing the disease attention should be given to strict quarantine and disinfectant measures. Incipient septicemia may be checked in many instances by intravenous injections of Collargol.

The treatment of parturient paresis by means of the air catheter, ZEHL (*Berlin. Tierärztl. Wchnschr., 1903, No. 1, pp. 5, 6*).—Notes are given on 15 cases of this disease which the author treated by forcing air into the udder. In all these cases recovery took place within a reasonable length of time, but in 13 out of the 15 cases a decided improvement or almost complete recovery was noted within 3 hours

after the administration of the air. In comparison with the results obtained by this method, the author states that in treating the same disease by the Schmidt method a mortality of 20 per cent was observed. The author believes, therefore, that the air treatment is in every way superior to the use of infusions of potassium iodid.

Notes on hemoglobinuria, SIMON (*Berlin. Tierärztl. Wchnschr., 1903, No. 4, pp. 51, 52*).—The author observed a number of cases of this disease during a general practice and describes the most common symptoms. As a rule a considerable anemia and emaciation were observed associated with an increase in temperature and a yellow coloration of the conjunctiva. In the majority of cases death took place within a few days. In controlling this disease the author recommends proper drainage of the soil in fields and corrals where cattle are allowed to run, and the free use of such well-drained pastures.

Ticks and African coast fever, C. P. LOUNSBURY (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 4–13*).—During the past season the author made a study of this disease in the Transvaal. The term African coast fever is preferred to Rhodesian cattle disease, Rhodesian tick fever, Rhodesian redwater, virulent redwater, etc., under which the same disease has been referred to by other writers. The disease is unquestionably different from ordinary Texas fever, but is transmitted by ticks, probably a species of Rhipicephalus commonly known as the brown tick. Notes are given by way of comparison showing the methods of transmission of other diseases by ticks and other animal parasites. It is of considerable importance to determine definitely just which species of ticks are concerned in the transmission of African coast fever. Experiments were made to determine the pathogenicity of *Rhipicephalus decoloratus*, *R. shipleyi*, *R. evertsi*, *R. simus*, *Hyalomma ægyptium*, and *Amblyomma hebræum*. Positive results were obtained only with *R. shipleyi*, commonly known as the brown tick, and this tick was found to be pathogenic only in its adult stage. Detailed notes are given on the habits and life history of the various species of ticks. In combating infestation with ticks the author recommends burning over infested fields wherever this method is possible, and the dipping and spraying of cattle with arsenical solutions. Carbolic dips are not recommended. Kerosene oil applied in various ways has given fairly satisfactory results. It is believed that 1 year is not too long a period of quarantine for infested fields.

Ringworm in cattle (*Bd. Agr. and Fisheries [London], Leaflet 95, pp. 2*).—Brief notes on the cause and treatment of this disease. A number of preparations are recommended for treating affected herds. Good results have been obtained from the use of a preparation containing 5 parts train oil and 1 part sulphur.

Warbles or grubs in cattle hides, R. C. JACOBSON (*Proc. Nat. Live Stock Assoc., 6 (1903), pp. 202–204*).—The author calls attention to the injury produced in cattle hides by the presence of the larvæ of the ox warble fly. It is stated that packers have agreed to classify cattle hides according to the number of warble holes in each hide. Class No. 1 includes only those hides which have not more than 4 warble holes. The author calls attention also to the irritation the presence of these grubs produces and of the consequent loss of flesh. The treatment for these parasites is comparatively simple and the author urges its prompt application.

Inspection of sheep on the range (*Proc. Nat. Wool Growers' Assoc., 38 (1903), pp. 75–84*).—This is a discussion by members of the association on the general subject of inspection of sheep on the public range, with special reference to its bearings upon the use of summer range, particularly in forest reserves. It was urged by some of the members that the general inspection of sheep for scab might result in some limitation of their privileges upon the public range.

Sheep pox and the epitheliomata of this disease, F. J. BOSC (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 5, pp. 413–420, figs. 2; 6, pp. 517–526, figs. 6; 7, pp. 667–674, pls. 3*).—A detailed description is given of the lesions observed in cases of this disease in the skin, cornea, rumen, fourth stomach, lungs, liver, kidney, pan-

creas, and mammary glands. The disease attacks not only the epithelia of lining membranes, but also the various glandular epithelia. A number of products of cellular degeneration were observed in the foci of the disease. The author made a careful examination of this degenerated material and believes that he found sporozoa which may be considered as the parasitic organism of the disease. The various stages of transformation were observed in the cellular elements which were found in the diseased foci along with the supposed pathogenic organism.

The conditions of commerce in tanned sheepskins and its sanitary regulation in the Government of Moscow, M. L. Blumenfeld (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), No. 9, pp. 980–991*).—The author discusses the dangers connected with the indiscriminate shipment and handling of the pelts of infected sheep and calls attention to the necessity of applying antiseptic treatment to these skins in order to prevent the development of infectious diseases.

A form of hog cholera not caused by hog-cholera bacillus, E. A. de Schweinitz and M. Dorset (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 41, pp. 4*).—An infectious disease of hogs was studied in southwestern Iowa and later in Washington in hogs which were imported from the original locality. Experiments and observations on this disease show that it is highly infectious, can not be distinguished clinically from hog cholera, but may be reproduced by inoculation with material which contains no hog-cholera bacilli. The period of incubation varies from 5 to 12 days.

The inoculation experiments made by the authors were on pigs which weighed from 15 to 40 lbs., and it was suggested that the period of incubation may be of longer duration in older hogs. Notes are given on the lesions observed in different parts of the body. Rabbits and guinea pigs were found to be refractory to the disease. The isolation of diseased animals and disinfection of infected premises has been found to be efficacious in controlling the disease.

Swine epizootics and means of repression, Röder (*Mitt. Oekon. Gesell. Sachsen, 1902–3, pp. 95–119*).—Statistics are given regarding the prevalence of swine erysipelas, swine plague, and hog cholera, together with a discussion of the remedies and means of prevention which have proved most successful in combating these plagues. The literature of the subject is briefly discussed. The author presents an account of various proprietary and commercial vaccines which have been manufactured for use in preventing the development of swine epizootics. The results obtained from the use of these vaccines by various investigators have differed considerably and further experiments are required to determine their value.

The bacterial flora of the intestines of hogs, E. Heinick (*Berlin. Tierärztl. Wchnschr., 1903, No. 9, pp. 141–143*).—The author's observations were carried out on a large number of hogs from which samples of the intestinal contents were taken for the purpose of comparing the bacterial content of this material. The results of these investigations are presented in the form of a table and indicate that a large number of known and unknown species of bacteria are commonly present in a hog's intestines. Culture experiments, together with the inoculation of experimental animals, failed to show the presence of pathogenic bacteria except in the rarest instances, and no bacilli of swine erysipelas were found in any case.

Experimental vaccination with Septicidin in Hungary, J. von Kukuljević (*Berlin. Tierärztl. Wchnschr., 1903, No. 6, pp. 79, 80*).—In the treatment of swine plague and hog cholera the author found that Septicidin applied at the right time and in the proper manner furnished a good means for preventing the further development of the disease and exercised a strong immunizing action in animals which were subsequently exposed to the disease. The details of the author's experiments are presented in tabular form.

Special report on diseases of the horse (*Washington: U. S. Dept. Agr., Bureau of Animal Industry, 1903, rev. ed., pp. 600, pls. 41, figs. 18*).—The first edition of this

report was issued in 1890 (E. S. R., 2, p. 518). The present edition has been revise and considerable new matter has been added, especially the article by L. Pearson o the examination of sick horses, and that on surra, by C. W. Stiles.

The following is a list of subjects treated in the volume: Examination of a sic horse, L. Pearson; methods of administering medicine, C. B. Michener; diseases o the digestive organs, C. B. Michener; diseases of the urinary organs, J. Law; disease of the respiratory organs, W. H. Harbaugh; diseases of the generative organs, J. Law diseases of the nervous system, M. R. Trumbower; diseases of the heart, blood ves sels, and lymphatics, M. R. Trumbower; diseases of the eye, J. Law; lameness A. Liautard; diseases of the fetlock, ankle, and foot, A. A. Holcombe; diseases of th skin, J. Law; wounds and their treatment, C. B. Michener; general diseases, R. S Huidekoper; surra, C. W. Stiles; shoeing, J. W. Adams.

The diseases of the army horse, G. JOLY (*Les maladies du cheval de troupe Paris: J. B. Baillière & Sons, 1904, pp. XII+456, figs. 39*).—The present volume i intended as a handbook on the diseases of the horse, with special reference to th diseases of greatest importance among army horses. The special subjects discusse by the author include glanders, contagious coryza, epizootic lymphangitis, horse pox intestinal diseases, overwork, skin diseases, broken knees, ruptures of tendons, bon diseases, wounds, important diseases observed in the French colonies, and the com mon diseases of camels.

Acute articular rheumatism in horses, ALTMANN (*Berlin. Tierärztl. Wchn schr., 1903, No. 4, pp. 50, 51*).—This disease has commonly been supposed to be o rare occurrence in horses and other domesticated animals. Undoubted cases wer observed by the author and notes are given on the symptoms and pathologica anatomy of this disease. The articular cartilages were found to have lost their glis tening appearance and the synovial secretion was considerably increased. In som instances pathological alterations of the heart were associated with the disease.

Articular inflammations in young colts, E. THIERRY (*Jour. Agr. Prat., n. ser. 6 (1903), No. 44, p. 574*).—The symptoms of this disease are briefly described. Th author believes that infection takes place through the navel and recommends anti septic treatment in preventing the disease.

The treatment of pneumonia with oxygen, TOEPPER (*Berlin. Tierärztl. Wchn schr., 1903, No. 3, pp. 37–42, figs. 2*).—A number of cases of this disease in horse were treated by inhalation of oxygen under pressure. A suitable apparatus for th administration of oxygen is described by the author. The effect of inhalation o oxygen upon the internal body temperature, pulse, respiration, and behavior of th animal is shown in a tabular form. No decided and uniform influence upon the rat and depth of the respiratory movements was observed. The discolored mucou membranes assumed a brighter red color.

The chief effect of oxygen when administered in cases of pneumonia is seen in th heart action. Oxygen appears to act as a heart stimulant and improves the genera condition of the animals. When administered during the earlier stages of the dis ease it is believed that many cases may be prevented from running a fatal course, an the expense is not prohibitive.

Experiments in the use of barium chlorid intravenously and per os in the treatment of colic in horses, MÜLLER (*Berlin. Tierärztl. Wchnschr., 1903, No. 7, pp. 109, 110*).—The author tested the value of this drug in about 40 cases of colic During these experiments it was found that when administered intravenously i a solution at the rate of 1:10, barium chlorid frequently gave rise to paralysis o the heart and sudden death of the horse. In some cases death resulted even whe administered in a solution at the rate of 1:40, and the author recommends that th drug be used in much more dilute solutions. When administered in solutions suffi ciently dilute to avoid any injurious effect upon the heart the general action of th drug was quite satisfactory.

Horseshoeing, J. W. ADAMS (*U. S. Dept. Agr., Farmers' Bul. 179, pp. 31, figs. 18*).—A systematic discussion of the problems of horseshoeing of most concern to the farmer and horse raiser. The subjects discussed include the anatomy of the foot and hoof, the physiological relations of these parts, the formation and various abnormal forms of the feet, the form and preparation of the shoe, the rubber pad, bar shoe, hot fitting, and various peculiarities in the form of the hoof as related to the requirements in the form and thickness of the shoe.

A monograph of the tsetse flies, E. E. AUSTEN (*London: British Mus., 1903, pp. IX+319, pls. 10, figs. 16*).—This volume contains an elaborate monograph of the genus Glossina, of which the following species are recognized: *G. pallidipes*, *G. longipennis*, *G. morsitans*, *G. longipalpis*, and *G. fusca*. This genus of flies is confined to Africa and its distribution is described in detail in connection with a map.

The author discusses the life history, habits, and systematic position of these flies, and presents bibliographies of literature relating to tsetse fly and the Trypanosoma of nagana, and kindred species. The mouth parts of Glossina and Stomoxys are described by H. J. Hansen. In appendices to the volume the author presents abstracts of some of the more important literature relating to tsetse flies, with notes on native methods of protecting animals against attacks of these flies, the geographical distribution of nagana and trypanosomiasis on the Upper Niger.

Spirillosis of fowls, E. MARCHOUX and A. SALIMBENI (*Ann. Inst. Pasteur, 17 (1903), No. 9, pp. 569–580*).—An outbreak of an infectious disease occurred in Rio Janeiro and caused the death of large numbers of chickens. This disease was found to be due to a spirillum which was also pathogenic to geese, ducks, guinea fowls, pigeons, turtle doves, and sparrows, but not to guinea pigs or monkeys. Affected fowls exhibit diarrhea, loss of appetite, a pale comb, and in acute cases die suddenly in convulsions. A certain percentage of chronic cases recover.

The pathogenic spirillum is found in the blood of affected birds, and the disease may be transmitted by inoculation with such blood. The disease is also produced by injection of the spirillum in cultures or of the excreta of affected birds. Under ordinary conditions *Argas persicus* is the carrier of the infection. The virulence of the spirillum is greatly diminished or lost after a period of about 48 hours. Successful vaccination may be produced by the use of blood and virulent serum preserved for from 48 hours to 4 days, or after heating for from 5 to 10 minutes at a temperature of 55°. The serum of animals which have recovered from the first attack possesses strong immunizing properties, and the same serum in vitro exercises a pronounced agglutinative action.

AGRICULTURAL ENGINEERING.

Report upon the administration of the public works department in Egypt for 1902, W. GARSTIN ET AL. (*Cairo: Public Works Ministry, 1903, pp. 476, pls. 15, dgms. 11*).—This includes a summary account and detailed reports of operations in the different departments of the Public Works Ministry during the year. The features of the report of the greatest agricultural interest are those dealing with the irrigation service.

The report of this service includes, among other topics, a discussion of the more efficient utilization of the Nile supply during the low water of 1902 by means of rotation in the use of water, the pumping of water for irrigation and drainage, the duty of water, drainage for removal of excess of water and alkali, and the filling and utilization of the water of the recently completed Nile reservoirs.

The report on the soil and water of the Wadi Tumilat lands under reclamation includes a discussion of situation, climate, geology, early history and present condition, nature and effect of the injurious salts present, cause of deterioration, and reclamation. Analyses of samples of the alkali efflorescences, the soil, and the drainage water of these lands show that the harmful salts present are sodium carbonate,

bicarbonate, chlorid, and sulphate. The accumulation of these salts in the soil is stated to be mainly due to seepage from the Ismailia Canal, which carries the water supply of this region. The method of reclamation which is being successfully employed consists of drainage and flooding to wash out the harmful salts.

Sanford system of irrigation (*Queensland Agr. Jour., 13 (1903), No. 4, pp. 308, 309*).—A combined system of subirrigation and drainage by means of glazed and unglazed tile, which is claimed to be in successful operation at Sanford, Fla., is briefly described. "The field is gridironed with a system of earthenware tile, about 18 in. below the surface, in squares of about 20 ft. The pipes running down the incline are of glazed tile, water-tight; these are the conducting pipes. The cross-pipes are of unglazed tile, not water-tight; these are used both for drainage and irrigation."

Irrigation in Tonkin (*Jour. Agr. Trop., 3 (1903), No. 29, p. 349*).—A brief note on Fesch's device used for raising water for irrigation in the uplands of Tonkin, based on an article in *Bul. Écon. Indo-Chine, Feb., 1903.*

Irrigation by means of artificial underground water, K. E. Widegren (*Agr. Jour. Cape Good Hope, 23 (1903), Nos. 4, pp. 456–461; 6, pp. 659–665, figs. 3*).—In this article the author discusses the feasibility of storing the water of streams in time of abundance by running them onto lands which present suitable infiltration areas, thus increasing the underground supply, which may be drawn on in time of scarcity, and explains in some detail the principles which underlie the suggested plan.

Pumping as an auxiliary to irrigation, F. Frank (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, pp. 554–557, pl. 1*).—The value of a pumping plant in case of a shortage of the usual supplies of irrigation water is explained and 7 designs of such plants are briefly described and illustrated.

Pumps and water-raising appliances for the farm, A. H. S. Baker (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 61, 62*).—Brief notes on various appliances suited to raising water for farm uses, especially irrigation.

Pumps, R. Masse (*Les pompes. Paris: Vve. Ch. Dunod, 1903, pp. 528, illus.*).

Irrigation engineering, H. M. Wilson (*New York: John Wiley & Sons, 1903, pp. XXIII+573, pls. 41, figs. 142*).—This is the fourth edition, enlarged and rewritten.

Device for flood gate and for clearing silt from before intake gate, F. Frank (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, p. 519, pl. 1*).—Drawings and a brief description are given of a gate which automatically closes when a flood reaches a given height, and causes an acceleration of the current past the intake gate so that accumulations of silt are removed.

Report on trials of agricultural machinery at Alnarp, 1902, A. Sjöström, N. Engström, et al. (*Meddel. Styr. Maskin-och Redsk. Profningsanst.* [*Stockholm*], *1903, No. 8, pp. 107, figs. 49*).—The report gives the results of trials of feed grinders, cake crushers, root cutters, plows, self-binders, and a number of smaller machines, and of dairy machinery, regenerative pasteurizers, milk forewarmers, the hand-separator "Perfect," Casse pasteurization regulator, Ulander milk strainer, etc.—F. W. WOLL.

Report on trials of agricultural machinery at Ultuna, 1902, G. Timberg, O. Nycander, et al. (*Meddel. Styr. Maskin-och Redsk. Profningsanst.* [*Stockholm*], *1903, No. 7, pp. 126, pls. 4, figs. 75*).—The report includes trials and critical examinations of feed cutters, steam locomobiles, scythes, harrows, manure spreaders, mowing machines, etc.—F. W. WOLL.

Trials with wagons with broad and narrow tires, F. Bokelman and E. Jorgensen (*Tidsskr. Landökon., 1903, No. 3, pp. 113–138*).

Trials with small thrashing machines for horse power (2–3 horses), C. V. Birk (*Tidsskr. Landökon., 1903, No. 3, pp. 139–200*).

Experiments with electrical plow installations, M. SCHILLER (*Arb. Deut. Landw. Gesell., 1903, No. 85, pp. 70, figs. 46*).—Three series of field trials of double-motor systems are reported, the apparatus and machines used being described in detail. The power was supplied from a central plant and the tests included deep plowing (30 to 36 cm.) on heavy soils and shallow plowing (14 to 18 cm.) on light soils, the object being to secure data on rapidity of work, amount of soil moved, loss of power, cost, and time required to move from field to field. The results are not considered conclusive and further tests are recommended.

The Scott motor cultivator (*Queensland Agr. Jour., 13 (1903), No. 4, pp. 316, 317, fig. 1*).—A petroleum motor adapted to a variety of farm operations is described and a comparison is made of the efficiency of motor and horse cultivation.

Agricultural implements and vehicles in foreign countries (*U. S. Consular Rpts., 73 (1903), No. 279, pp. 729–742*).—This is a series of reports in continuation of those already noted in the Record (E. S. R., 15, p. 416). The countries reported on in this article are Denmark, British India, Uruguay, and Honduras.

Roads; their construction and maintenance, with special reference to road materials, A. GREENWELL and J. V. ELSDEN (*London: D. Fourdrinier, 1901, pp. 280, figs. 48*).—An elementary treatise suited especially to English conditions.

An essay on the history of rural engineering, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 2 (1903), No. 2, pp. 181–212, figs. 22*).—The development of rural engineering during the prehistoric period is briefly traced in this article.

[The octagonal silo], A. T. NEALE (*Delaware Sta. Rpt. 1902, pp. 30–35*).—The methods and cost of construction as well as the practical advantages of octagonal silos are discussed.

"The octagonal silo may be regarded as a compromise between the old style square shaped, heavily framed or thick walled stone form and the modern lightly constructed stave silo, circular in shape and bound by iron hoops." The experience on a number of farms in Delaware with silos of this type constructed upon plans and specifications furnished by the station is cited to show that such silos have proven very satisfactory in practice, and as regards cost, availability of material, ease of construction, durability, and efficiency possess many decided advantages.

The construction of such a silo 13 ft. from face to face and 22 ft. deep, having a capacity of 68 tons when properly filled with settled corn and cowpea silage, is thus briefly described:

"If eight pieces of seasoned white oak, each 3 in. thick, 6 in. wide, and 6 ft. long, are so placed as to form a regular eight-sided figure with the corners bolted together, the sill of the silo will have been formed, and this drawn down into soft cement by the corner bolts which extend into the masonary foundation 10 in. will make an air-tight base. Posts of black or red oak, each 3 in. thick, 6 in. wide, and 18 in. tall are set upright at each of the eight corners of this sill and firmly spiked to it; upon the top of said posts a second eight-cornered hoop of black or red oak, but in all other respects similar to the sill, is built. Seven similar hoops are in turn built one upon the other, upon posts which increase in length as the height of the structure increases, until the posts which bear the plate are reached and these may safely measure 3 ft. in length. These hoops may be compared with those which bind together the staves of a barrel.

"In the silo the staves are of inch boards, 1 ft. wide, firmly nailed both to plate and sill, as well as to all of the intermediate hoops. These boards may be of hemlock, or poplar and of second or third rate quality, for their province is simply to hold plastering lath, which in turn supports a coating of good cement. If after this cement has hardened and dried thoroughly it is treated to a coat of gas tar thickened with slate ground to flour, an enduring and perfectly impervious lining will result, examples of which after 16 years in constant use may be cited in this State.

"Just as boards used as staves are nailed upon the inner surface of the hoops, so weather boarding is nailed to their outer edges. When roofed to suit the owner's taste the silo is completed."

The cost of construction of such a silo is estimated to be $150.10.

"Octagonal silos without cemented linings are in use, and one in particular has been filled three times at least with satisfaction. . . . The lining is made of two thicknesses of chestnut boards with tarred paper between them. . . . The wastes have been moderate and the lining shows few if any signs of decay. The owner is, however, inclined to feel that losses of silage would have been smaller had he . . . used the lath and cement construction."

The utilization of town refuse in agriculture, Von Kahlden (*Mitt. Oekon. Gesell. Sachsen, 1902–3, pp. 1–31, dgm. 1*).—A general discussion of the subject with descriptions of methods followed by different municipalities, but especially in Dresden.

Artificial refrigeration and its industrial, commercial, and agricultural applications, J. De Loverdo (*Le froid artificiel et ses applications industrielles, commerciales et agricoles. Paris: Vve. Ch. Dunod, 1903, pp. VII+652, figs. 156*).—Different chapters treat of the machines and equipment for mechanical refrigeration; refrigeration plants; applications of artificial refrigeration in the management of foods, fruits, vegetables, and miscellaneous materials, in storage and in transport; and the development of the refrigeration industry.

Cheap power for cold stores and ice factories, G. D. Hunt (*Proc. Cold Storage and Ice Assoc., 4 (1903), No. 1, pp. 35–41*).—A brief paper followed by general discussion.

MISCELLANEOUS.

Fourteenth Annual Report of Delaware Station, 1902 (*Delaware Sta. Rpt. 1902, pp. 163*).—This includes a financial statement for the fiscal year ended June 30, 1902; the organization list of the station; and reports of the agriculturist, mycologist, chemist, horticulturist, entomologist, and meteorologist, abstracted elsewhere.

Sixteenth Annual Report of Illinois Station, 1903 (*Illinois Sta. Rpt. 1903, pp. 13*).—This consists of a list of the publications of the station during the year, mention of the principal lines of work, a subject list of Bulletins 1–88, of the station, and a detailed financial statement for the fiscal year ended June 30, 1903.

Sixteenth Annual Report of Maryland Station, 1903 (*Maryland Sta. Rpt. 1903, pp. XXXII+200*).—The report of the director includes a brief history of the station; statements concerning the organization, equipment, and work of the station; a discussion of some of the results of station work with special reference to their practical application; a subject list of station publications; financial statements for each year from 1888 to 1903, inclusive; and a summary of observations on temperature and rainfall. Appended to the report are reprints of Bulletins 85–89 of the station on the following subjects: Alfalfa for Maryland (E. S. R., 14, p. 433); the influence of preservatives upon the food value of milk (E. S. R., 14, p. 679); the periodical cicada, and its appearance in Maryland in 1902 (E. S. R., 14, p. 988); economical methods for improving the keeping qualities of milk (E. S. R., 15, p. 293); experiments upon the use of potash as a fertilizer (E. S. R., 15, p. 461).

Twenty-First Annual Report of Ohio Station, 1902 (*Ohio Sta. Rpt. 1902, pp. XXIV*).—This includes the organization list of the station; a report of the Board of control; a financial statement for the fiscal year ended June 30, 1902; and a report of the director containing a review of the work of the station during the year, and a list of acknowledgments.

Report of the agricultural chemical experiment station at Vienna for 1902 (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 213–268*).

Report of the chemical physiological experiment station for grape and fruit growing at Klosterneuburg for 1902 (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 269–284*).

Report of the agricultural chemical station at Göritz for 1902 (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 285–313, pl. 1*).

Report of the agricultural experiment station at Spalato for 1902 (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 3, pp. 314–337*).

Eighth annual report of the Pennsylvania department of agriculture, 1902 (*Pennsylvania State Dept. Agr. Rpt. 1902, pt. 1, pp. 1029*).—This includes reports of the State secretary of agriculture, director of farmers' institutes, dairy and food commissioner, veterinarian, and economic zoologist. The last 2 reports are noted elsewhere. The papers read at the annual meeting of the State board of agriculture dealing with dairy hygiene, food adulteration, pollution of wells, and preparation for farm work are included.

The following articles included in the report have been noted from other sources: Methods of steer feeding (E. S. R., 13, p. 880; 14, p. 684), treatment for San José scale in orchard and nursery (E. S. R., 14, p. 169), canning of fruits and vegetables (E. S. R., 14, p. 147), bacteria of the soil in their relation to agriculture (E. S. R., 14, p. 749), some common insect pests of the farmer (E. S. R., 14, p. 780), the varieties of fruit that can be profitably grown in Pennsylvania (E. S. R., 14, p. 965), the natural improvement of soils (E. S. R., 14, p. 849), the fundamentals of spraying (E. S. R., 13, p. 876; 14, p. 592), insects injurious to cucurbitaceous plants (E. S. R., 14, p. 886), modern dairy science and practice (E. S. R., 14, p. 1014), cocoa and chocolate (E. S. R., 11, p. 970), potato culture (E. S. R., 14, p. 960), the management of greenhouses (E. S. R., 14, p. 763), and phosphates (E. S. R., 12, p. 930; 14, p. 556).

Press bulletins (*Ohio Sta. Bul. 135, pp. 117–135*).—This consists of reprints of press bulletins issued during the year. The subjects discussed are as follows: Fighting the chinch bug, soil analysis as a guide to the use of fertilizers, the Hessian fly, lime as a fertilizer, how much seed wheat to the acre, can we afford to omit nitrogen and potash from our fertilizers, oat smut and how to prevent it, sweet clover as a soil ameliorant, spraying for the San José scale, bitter rot of apples, grape rot and its prevention, and special spraying instructions.

Agricultural statistics (*Ontario Bureau Ind. Rpt. 1902, pp. 5–46*).—This includes meteorological observations; notes on the condition of crops; and statistics on field crops, fruits, live stock, valuation of farm property, cheese factories, etc.

Agricultural statistics of Belgium for 1902 (*Statistique de la Belgique, recensement agricole de 1902. Brussels: Min. Agr., 1903, pp. 261.*)—These statistics include the distribution and yield of field crops; the quantities of fertilizing material and feeding stuffs used in 1902; the number of horses, cattle, and swine on Belgian farms; together with the losses and natural increase during the year and the number of farms in the different provinces, classified according to their area.

Agricultural imports of Germany, 1897–1901, F. H. Hitchcock (*U. S. Dept. Agr., Division of Foreign Markets Bul. 30, pp. 323*).—This is a detailed statistical report upon this subject. The total imports during the 5 years averaged annually $1,258,129,280, of which the agricultural imports constituted 59.23 per cent. Of the agricultural imports during 1901, 21.86 per cent came from the United States, 16.26 per cent from Russia, and 10.60 per cent from Austria-Hungary. Raw materials constituted 45 per cent of the agricultural imports. The leading items were grain and grain products, vegetable fibers, animal fibers, meat and meat products, live animals, seeds, hides and skins, fruits and nuts, coffee, and tobacco.

Yearbook of agriculture and agricultural societies, C. Silvester (*Annuaire de l'agriculture et des associations agricoles. Paris: Author, 1903, pp. XII+2052*).—This book outlines the history of agricultural societies in France and gives the text of the laws enacted for their establishment and regulation, together with the text of the most important legislation bearing on agriculture. The agricultural administration in the national government as well as in the government of each territorial department is described, and in each case agricultural statistics are given. The

agricultural shows and markets together with agricultural industries, breeders of various kinds of farm animals, producers of special crops, manufacturers of and dealers in articles used by the farmer and his family, and dealers in agricultural products, etc., are listed.

Agricultural geography of France and the world, J. Du Plessis de Grenédan (*Géographie agricole de la France et du monde. Paris: Masson & Co., 1903, pp. 424, maps 85, dgms. 33*).—This book is divided into 3 parts, treating of France, the French Colonies, and the world in general. The chapters devoted to France discuss the geographical location, area, and topography of the country, the natural and artificial conditions affecting agriculture, the distribution of crops, and the nation's agricultural wealth, in addition to considering the culture of different crops and the raising of various kinds of live stock.

The French Colonies are divided into 2 groups, according to their location in temperate and tropical regions, and each colony is described separately. The third part, which has reference to the world in general, treats of soil, water, climate, agricultural regions, population, commerce, plant and animal production, and the different nations engaged in agriculture.

Farming, W. M. Tod (*London: J. M. Dent & Co., 1903, pp. 268, pls. 8*).—This book devotes a chapter to each of the following agricultural topics: Fertility, the improvement of soils, manuring, cereal crops, roots, green crops, clovers and grasses, live stock, farm horses, and cattle. In addition, the interesting features and the pleasures connected with farm life and the profitableness of the pursuit under the changed conditions in Great Britain are discussed.

Rural economy, E. Jouzier (*Économie rurale. Paris: J. B. Baillière & Son, 1903, pp. XV+476, figs. 10*).—This is one volume of the *Encyclopédie agricole* published under the direction of G. Werry.

The principles and aims of modern agriculture, Wölfer (*Grundsätze und Ziele neuzeitlicher Landwirtschaft. Berlin: Paul Parey, 1903, pp. VIII+281, figs. 5*).—This book on rural economics treats of the increase and cheapening of production of crops and animals, credit, organization and cooperation, farm accounts, and the promotion of technical education.

New elementary agriculture, C. E. Bessey, L. Bruner, and G. D. Swezey (*Lincoln, Nebr.: The University Pub. Co., 1903, pp. 194, figs. 62*).—An elementary text-book designed for rural and graded schools.

NOTES.

California Station.—J. H. Barber, formerly in charge of the Foothills Substation at Jackson, recently closed, has been transferred to the Southern California Substation at Ontario.

Hawaii Station.—The station has received a donation of $500 from the Hawaiian Stock Breeders' Association for experiments in range improvement.

Florida University and Station.—Foster Hall, the young women's dormitory, was totally destroyed by fire, together with most of its contents, during the holidays. The building was a 2-story frame structure. It will be replaced by a new brick dormitory to be erected on the old site. H. H. Hume, horticulturist in the university and station, has accepted a similar position under the North Carolina Board of Agriculture.

Iowa College and Station.—Among the legislative appropriations asked for by the board of trustees are the following items for experiment station work: Soils, $6,000; corn investigations, $6,000; horticulture, $5,000; experiments with beef cattle, $10,000; with swine, $3,000; with sheep, $2,000; dairy and creamery investigations, $5,000; poultry work, $3,000; agricultural extension work, $5,000; and good-roads experimentation, $5,000. An appropriation of $15,000 is asked for the establishment of an engineering experiment station, $75,000 for a new dairy building, $25,000 for dairy farm land, and $25,000 for furnishing and equipping the dairy farm and poultry department. Plans are being made for a new agricultural hall to cost $250,000.

Massachusetts College.—The trustees at their annual meeting voted to ask the State legislature for an appropriation of $38,000 for a horticultural building, and $1,000 annually for its maintenance. A bill looking to this is now before that body. As a result of negotiations with Simmons College, at Boston, the trustees approved an agreement whereby not over twenty students from Simmons College may take horticulture, entomology, and botany for the third year of their course in horticulture, on the payment of from $2,500 to $3,000 to the agricultural college. The plan can not be carried out for two years.

Montana College and Station.—V. K. Chesnut, of this Department, entered upon his duties as chemist to the college and station January 20.

Nevada College and Station.—J. N. Evans, president of the board of regents and board of control, recently met with a fatal accident while at work on his ranch. The funeral was held in the university gymnasium under the auspices of the institution, and with military escort. Mr. Evans' large business experience and ability made him a most useful and efficient regent. John E. Bray, of Reno, a man of long experience in educational work, has been appointed to fill out the unexpired term. The station has recently purchased new horses and is now stocking with types of dairy cattle, sheep, and hogs.

Cornell University and Station.—A bill has been introduced in the State Assembly appropriating $250,000 for a hall of agriculture. Governor Odell in his annual message called attention to the needs of the agricultural college and to the fact that there had been many applications from the agricultural interests for such recognition. He said: "Without making any specific recommendations as to the line which you should follow, I do desire to impress upon you the necessity for complying with these demands, which I believe to be reasonable and in the interest of New York." Speaker

Nixon, in his opening remarks to the Assembly, also gave considerable attention to the need of more adequate provision for agricultural instruction, citing the example of other States in this respect. In conclusion he said: "We should maintain a State agricultural college equal to the best in the Union. It is for our interest to do so, and our large agricultural population and the amount of capital invested in their industry, which is the basis of all prosperity, constitute a claim that should no longer be ignored." Referring to the Cornell School of Forestry, the governor expressed the belief that the school should not be discontinued, "because with the lapse of years a proper understanding of scientific forestry will become more and more a necessity. This is particularly true of farm forestry, which will form an important part of the future of agriculture within the State. That our people do not desire, however, that public lands shall be denuded is beyond question." He recommends immediate legislation to recover the property to the State, embracing about 30,000 acres, and suggests an adjustment of the contracts made with the Brooklyn Cooperage Co. either by the executive or the courts, relieving Cornell University of any burden in the matter. The university has acquiesced in this plan.

Ohio Station.—George M. Lummis has resigned as assistant botanist on account of ill health.

Oregon College and Station.—Hon. William W. Cotton, of Portland, Oreg., has been appointed regent, vice Benton Killin.

Pennsylvania Station.—John Foster has been appointed assistant chemist.

Porto Rico Station.—Hendrick C. Hendricksen, of the subtropical laboratory conducted by this Department at Miami, has been appointed assistant horticulturist to the station. During the year prominence has been given to the investigations with coffee, tobacco, and tropical fruits. Experiments with reference to improving the old coffee groves were commenced immediately after the crop of 1902 was harvested, and record was made of the yield of each of ten plats before the treatment began. Several acres of virgin forest have been cleared and planted with coffee trees from the nurseries. A number of foreign varieties have been planted, and the plantation of Porto Rican varieties will be used for studying the best distances for growing the trees, making experiments with shade, manures, and pruning. The tobacco investigations consist of a preliminary survey of the principal tobacco districts, and experiments with methods of cultivation, manuring, curing, and fermenting. The cultural work is being carried on in cooperation with a farmer at Aguas Burnas. The work with tropical fruits has been confined mainly to the assembling of plant material and the propagation of nursery stock. The station nurseries contain all of the citrus varieties to be found on the island, most of the stock being large enough to bud. The orchards now contain 45 varieties of bananas, 24 of budded oranges, lemons and grape fruit, 12 of cacao, and about 65 varieties of miscellaneous tropical fruits. Experimental plantings have been made of cassava, yautia, malangas, yams, and other tropical tubers, as well as vegetables from Northern-grown seeds.

Vermont Station.—The station has recently added to its farm buildings a hennery, 16 by 80 ft. in size. The building is constructed of novelty siding and paper, with slate roof, and is sealed inside with pine. A feed and tool room, 8 by 12 ft., is provided at one end, and the remainder of the space is divided into 4 general sections for separate flocks, each having a scratching shed, 12 by 12 feet, with southern exposure, protected by long glass windows hung with hinges at the top and balanced with weights. One section has oiled cloth in place of windows to test this protection in comparison with glass. Adjoining each scratching shed is a laying and roosting room, 6 by 12 ft., and a yard on the south side 56 ft. deep. Each section is intended to accommodate 40 fowls. At present only three breeds—Barred Plymouth Rocks, Rhode Island Reds, and White Wyandottes—are being kept.

Referees of Official Agricultural Chemists.—The appointments of the referees and associate referees of this association for the year 1904 had not been made at the

time the account of the annual meeting of the association was published. These have just been received from the secretary, Dr. H. W. Wiley.

The list of referees is as follows: *Phosphoric acid*, C. B. Williams, Raleigh, N. C.; *nitrogen determination*, C. H. Jones, Burlington, Vt.; *separation of nitrogenous bodies*, E. B. Hart, Geneva, N. Y. (milk and cheese proteids); *potash*, F. B. Carpenter, Richmond, Va.; *soils*, C. G. Hopkins, Urbana, Ill.; *dairy products*, G. E. Patrick, Washington, D. C.; *foods and feeding stuffs*, J. O. LaBach, Lexington, Ky.; *food adulteration*, W. D. Bigelow, Washington, D. C.; *sugar*, L. S. Munson, Washington, D. C.; *tannin*, G. A. Kerr, Damascus, Va.; *insecticides*, B. H. Smith, Washington, D. C.; *ash*, R. W. Thatcher, Pullman, Wash.; *medicinal plants and drugs*, L. F. Kebler, Washington, D. C.

Following are the associate referees: *Phosphoric acid*, F. P. Veitch, Washington, D. C.; *nitrogen determination*, F. A. Urner, Geneva, N. Y.; *separation of nitrogenous bodies*—meat proteids, W. D. Bigelow, Washington, D. C., and vegetable proteids, J. S. Chamberlain, Washington, D. C.; *potash*, G. S. Fraps, College Station, Tex.; *soils*, R. H. Loughridge, Berkeley, Cal.; *dairy products*, F. W. Woll, Madison, Wis.; *foods and feeding stuffs*, J. K. Haywood, Washington, D. C.; *food adulteration*—colors, W. G. Berry, Appraiser's Office, New York, N. Y.; saccharine products (including confectionery), E. B. Kenrick, Winnipeg, Manitoba, Canada; fruit products, E. M. Chace, Washington, D. C.; wine, G. E. Colby, Berkeley, Cal.; beer, H. E. Barnard, Concord, N. H.; distilled liquors, C. A. Crampton, Washington, D. C.; vinegar, R. Fischer, Madison, Wis.; flavoring extracts, R. E. Doolittle, Lansing, Mich.; spices, A. L. Winton, New Haven, Conn.; baking powder and baking chemicals, R. O. Brooks, Trenton, N. J.; meat, M. E. Jaffa, Berkeley, Cal.; fats and oils, L. M. Tolman, Washington, D. C.; dairy products, A. E. Leach, Boston, Mass.; cereal products, A. McGill, Ottawa, Canada; infants and invalids' foods, H. W. Wiley, Washington, D. C.; vegetables, F. W. Bedford, St. Paul, Minn.; condiments other than spices, J. D. Hird, Washington, D. C.; cocoa and cocoa products, E. N. Eaton, Chicago, Ill.; tea and coffee, H. C. Lythgoe, Boston, Mass.; and preservatives, W. D. Bigelow, Washington, D. C.; *sugar*—molasses methods, H. E. Sawyer, Boston, Mass.; special analytical methods, C. A. Browne, jr., Audubon Park, New Orleans, La.; *tannin*, H. C. Reed, Stamford, Conn.; *insecticides*, S. Avery, Lincoln, Nebr.; *ash*, F. T. Shutt, Ottawa, Canada.

Diversification Farms.—The Department of Agriculture has arranged for conducting during the coming season 30 farms in the Southern States to serve as demonstrations in farm management. These farms will be of from 40 to 50 acres each and are located as follows: Texas, 14; Louisiana, 5; Mississippi, 3; Alabama, 3; Georgia, 2; South Carolina, 2; Florida, 1. These farms will be located on private farms and will be under the direction of officers of the Bureau of Plant Industry, who will visit them frequently during the season. The Department will furnish the seed and one-half of the fertilizer, and the expense of carrying on the farms will be borne by the owners, who will enter into an agreement to carry on the areas set aside according to plans prescribed by the Bureau of Plant Industry. General farm crops will be grown with reference to demonstrating the practicability and the methods of diversified agriculture. The immediate charge of this will be in the hands of W. J. Spillman, the agrostologist.

Challenger.—The December-January number of *Agriculture*, the publication issued by the agricultural students of the University of Nebraska, gives an account of the raising and feeding of Challenger, the champion steer of the International Live Stock Exhibition. Challenger was raised by a farmer in Nebraska, his dam being a Shorthorn cow with enough Holstein blood to give her a blue-white color and quite ordinary in appearance, while his sire was a registered Hereford bull of unusual individual merit. He was selected by Prof. H. R. Smith, of the department of animal husbandry, from a bunch of 2-year-old steers last May. At that time he weighed 1,300 lbs. and was purchased for 5 cts. a pound, or a total of $65. The breeder, who was

also his feeder until May 1, showed him no preference, for, as he says, "we noticed nothing in him to give him a preference." He was fed by the university from May until the time he was shipped to Chicago, and during the latter part of the period "was under extremely high-pressure feeding, consuming 25 lbs. of grain per day besides a few pounds of sugar beets and about 8 lbs. of alfalfa and prairie hay." He gained 200 lbs. in the last two months and weighed 1,760 lbs. when he was shipped to the show. His total cost to the college, not including freight and labor, was $105.72. He won $430 in prize money and sold for 26 cts. per pound, or approximately $450. Challenger dressed 1,135 lbs. of meat, or 65 per cent of his live weight. It was reported at the place where he was slaughtered that "he made a magnificent carcass of beef, by far the best our cattlemen had ever seen." Challenger is being mounted for the St. Louis Exposition, after which he will be returned to the University of Nebraska for class-room illustration.

Farmers' Institutes in Georgia.—The past year a very successful series of farmers' institutes was held in the State, which aroused much interest. This was the first systematic attempt to introduce the farmers' institutes, and was supported by the University of Georgia, the trustees of which set aside $1,000 for the purpose. During the year 44 institutes were held, one in each senatorial district of the State. One of the objects of the first year's work was to organize the institute system thoroughly, and with this end in view a president and secretary were elected for each district, and a vice-president from each county in the district. One-day sessions were held, with an average attendance of between 150 and 200. The faculty of the agricultural college and the staff of the experiment station took part in these institutes, presenting papers at a considerable number of meetings, but neither organization was made responsible for the management of the institutes, which was placed in the hands of Hon. Harvie Jordan, of Monticello, as director of institutes. It is hoped that provision will be made for carrying on the institutes another year so that at least one meeting may be held in each county and the sessions continued for two days in each place.

Hawaiian Sugar Chemists' Association.—An association of chemists who are or have been engaged in sugar work, either in sugar factories or in experiment station laboratories in Hawaii, has been formed with a membership of over thirty. The object of the association is the study of sugar chemistry and the methods of analysis used in the chemical control of sugar-house work, with a view to arriving at uniformity both in methods and statement of results. A meeting was held October 26 and 27, 1903, at which provisional methods were adopted and these, together with specimen blanks for the rendering of reports, have been issued in pamphlet form. The president of the association is P. A. G. Messchaert, of Waipahu, Oahu, and the secretary-treasurer is E. C. Shorey, chemist to the Federal experiment station at Honolulu.

School of Practical Gardening for Girls.—A recent issue of the *British Medical Journal* describes the women's branch of the Practical Gardening School of the Royal Botanic Society. The pupils in this school are for the most part young women who have obtained scholarships from the London school board, and who intend to adopt gardening as a profession. They are nominated by the technical education board of the London County Council. The students are allowed to work in a portion of the grounds of the botanical gardens in Regent's Park, and also learn practical hothouse work in the conservatories.

"The longest course is three years. The first-year students are taught ground operations, flower and vegetable gardening, and everything connected with the operations. During the second year the subjects taught are outdoor work, indoor work, and theoretical work. The third year is devoted to pruning, mowing, care of conservatory, plant houses, frames and pits, etc., and to theoretical work, such as keeping accounts, elementary meteorology, landscape gardening, sprays and washes for insect pests, and to classes and laboratory work in botany and horticultural chemistry.

"A new laboratory has been built for the use of students, and theoretical lectures followed by practical teaching are given on botany, elementary and advanced general histology, morphology, and physiology. Those students who wish to learn gardening as a pastime are allowed to attend on special days. The course of study in the botanical and horticultural laboratory is under the direction of Prof. E. J. Schwarz. Owing to the satisfactory report of the progress made by the scholars, the board has doubled its grant to the Royal Botanic Society, and now offers twenty scholarships instead of ten. Students readily find situations, and it is interesting to note how many people now employ lady gardeners in preference to men."

Bills before Congress.—A bill introduced into the Senate calls for an appropriation of $250,000, to be expended at the rate of $50,000 a year, to enable the Department of Agriculture to carry on, in conjunction with the experiment stations in the noncorn-growing States, experiments in the breeding, rearing, and finishing of live stock for market, the introduction and development of horses, cattle, sheep, and swine suitable for such regions and conditions, and the introduction and cultivation of suitable crops and forage plants.

The agricultural appropriation bill was reported in the House of Representatives February 4, and passed the following day. It carries a total appropriation of $5,711,240, an increase of $233,080 over that for the present year. The chairman, in presenting the bill, stated it to be the judgment of the committee that "although the estimates have not in all cases been allowed, the several amounts recommended will be ample to keep all branches of the Department of Agriculture in progressive motion, and will fully meet all the proper and justifiable demands of the country upon the Department." In reply to the assertion of some that the United States is not spending money enough toward the promotion of agriculture, statistics collected by the Census Bureau were presented showing that as nearly as could be ascertained the aggregate yearly expenditure for agriculture by the States and Territories amounts to something over $4,500,000, "which added to the $6,250,000 spent annually by the United States Government for the same cause makes a total of $10,750,000 spent annually for the promotion of agriculture. Certainly this is a most liberal figure, and much more than is being expended by any other Government in the world for the same purpose." The bill contains a new clause relating to the experiment stations, which authorizes and directs the Secretary of Agriculture "to coordinate the work of the several stations and the work of the stations with the Department of Agriculture, to the end of preventing unnecessary duplication of work, of increasing the efficiency of the stations and the Department of Agriculture, and to unify and systematize agricultural investigations in the United States." This is in line with the trend of discussion in the hearings of the Committee on Agriculture. An amendment to the bill, offered by Hon. H. C. Adams, providing for an increase in the appropriation to the stations along the lines of the bill previously introduced by him, was ruled out on a point of order.

A joint resolution has been introduced in Congress authorizing the printing of 4,000 additional copies of the Report of Irrigation Investigations in Utah, which was issued in a limited edition last summer as a bulletin of this Office.

Several bills have been introduced in both branches of Congress for the construction and improvement of roads and the establishment of a Bureau of Public Highways in the Department of Agriculture. Four of these call for an appropriation of $24,000,000 for road building in cooperation with the various States and Territories, to cover a period of 3 years. Another appropriates $50,000,000, and provides for the issuing of bonds for this purpose if necessary.

Personal Mention.—F. H. King, Chief of the Division of Soil Management of the Bureau of Soils, has resigned to take effect June 30. He was relieved from charge of the laboratory February 1, and will prepare a report upon his investigations. Professor King entered the Bureau of Soils in November, 1901.

E. E. Ewell, for several years connected with the Bureau of Chemistry of th Department, and for the past year in charge of the Atlanta office of the Germa Kali Works, died in New Orleans February 7.

Director E. B. Voorhees, of the New Jersey Stations, has been appointed presider of the New Jersey State Board of Agriculture.

W. B. Madison, of the National Farm School at Doylestown, Pa., goes March 1 t the Mount Hermon School, near Northfield, Mass., as horticulturist.

Prof. Pierre Mouillefert, professor of horticulture and forestry at the Nationa Agricultural School of Grignon, France, died December 26, 1903. He had been con nected with the institution since 1864, as student and assistant, and subsequently a professor. He published a book on the vineyards and wines of France, and a brie treatise on the culture of truffles, and wrote largely for French agricultural journals A treatise on sylviculture, consisting of four volumes, of which two have appeare and the others are in press, is also from his pen. In 1874 he was commissioned by th French Government to investigate the destruction of vineyards by the Phylloxera

Miscellaneous.—Wellesley College announces a course in general horticultur and elementary landscape gardening. The course includes lectures on the prepara tion of soils, the propagation, cultivation, and pruning of plants, school gardens and planting designs; and a brief consideration of the plants used in practical plant ing. The lectures will be supplemented by reading, work in the greenhouse, prac tice in making planting plans, practical work in the field, and visits to gardens, nurseries, and estates in the vicinity. The course covers one year and includes 3 hours a week for that period. It is in charge of Henry S. Adams, instructor in botany. The college has also offered for a couple of years past a course in trees and forestry, covering one year and including forest botany and sylviculture, the forests of the world, value and uses of their products, and the protection of wood lands.

Simmons College, Boston, offers a course in theoretical and practical horticulture designed to aid young women who wish to undertake the cultivation of flowers, fruits, and vegetables for commercial or other purposes. The course serves also as a practical basis for landscape gardening. It will extend over either three or four years, the first two years to be spent in Boston studying the underlying sciences and theoretical elements of horticulture, and the third year at the Massachusetts Agricultural College, as mentioned elsewhere.

The Girls' Industrial College, at Denton, Texas, which was opened to students the latter part of last September, will give considerable attention to the teaching of horticulture and ornamental gardening. This is provided for in the department of rural arts, in charge of A. J. Seiders, which will embrace floriculture, horticulture, truck and berry growing, dairying, bee keeping, and poultry keeping. Three new greenhouses 18 by 40 ft. have been completed and a small nursery has been established. The campus of about 70 acres will be devoted largely to landscape gardening and forestry.

The department of economics and sociology recently established by the Carnegie Institution, in charge of Carroll D. Wright, Commissioner of Labor, has undertaken the preparation of an economic history of the United States, embracing eleven subjects. The second of these subjects, relating to agriculture and forestry, including public land and irrigation interests, has been assigned to President K. L. Butterfield, of the Rhode Island College. This part of the work, it is understood, will be carried on with the collaboration of experts in various branches of agriculture.

According to press reports, George C. Creelman, superintendent of farmers' institutes in Ontario, has been appointed president of the Ontario Agricultural College at Guelph, to succeed Dr. James Mills, who has retired after twenty-five years of service to become a member of the railway commission newly appointed by the Dominion government. Mr. Creelman entered upon his duties February 1.

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EXPERIMENT STATION RECORD.

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The progress which has been made in organizing agricultural work in the Philippine Islands appears to be most gratifying and encouraging when the island conditions and the short period of operation are taken into account. The prime importance of agriculture in the development of the islands, the diversity of this industry, and its crude and crippled condition combine to make the field one of unusual opportunity and attractiveness to the agricultural expert and experimenter. The introduction into the islands of American methods for the improvement and promotion of agriculture has been full of interest to those who have watched its progress from afar.

Something of the present organization of the Bureau of Agriculture and the lines of work which have been inaugurated is learned from the second annual report of its chief, Prof. F. Lamson-Scribner. Professor Scribner entered upon the work of organizing the bureau about two years ago, and at the time the above report was concluded (last August) had been in the islands only about eighteen months. The difficulties of securing a competent staff of employees, the natural conditions of the islands, ravages of disease among the domestic animals, and the distance from the base of supplies have presented many obstacles and inevitably impeded progress, but in spite of this the bureau has been placed upon a substantial working basis and work undertaken in the leading branches of agriculture in the islands.

The organization now includes a central office at Manila, with experts in charge of seed and plant introduction, fiber investigations, soil studies, and animal industry; an experiment station and testing grounds near Manila, and six other stations and farms located at various points in the islands. At most of these outlying stations and farms buildings have been erected for the officers in charge and for laborers and animals, and a large amount of preliminary work has been performed in the direction of securing draft animals and farm machinery, getting the land into condition, establishing plantations, constructing the necessary roads, and other pioneer work. The total number of employees in the bureau last August was 205, 29 of whom were Americans and 176 natives. Most of the latter were laborers, although several natives were satisfactorily filling positions of considerable responsibility.

During the year seven farmers' bulletins and four regular bulletins were issued, mostly in both English and Spanish. The editions of these varied from 2,000 to 3,500, and it is noted that the first editions of several of the farmers' bulletins have been exhausted, necessitating reprints. On the basis of replies to a circular of inquiry sent out by the bureau regarding the agricultural products of the islands, an annotated list of the principal agricultural plants and products, exclusive of fibers, has been prepared for publication. Information has also been gathered regarding the cost of land, conditions of labor, the cost of establishing and maintaining plantations of abacá, cocoanut, tobacco, and other leading crops, as many inquiries came to the bureau from prospective planters. This gives an interesting insight into the prevailing conditions and methods, and should prove very useful.

Nearly 22,000 packages of assorted seeds have been distributed, reaching almost every province in the archipelago. These have included 137 varieties of American-grown field and garden seeds, and it is pointed out that the requests have come very largely from native farmers. It has been clearly demonstrated that many garden vegetables of American origin may be grown to perfection in the islands. A number of native fruits and vegetables are thought to be very promising and worthy of experiment to determine the cost of culture, possibility of improvement by selection, etc.

A variety of the most modern agricultural implements and farm machinery have been introduced by the bureau and put in use. It is interesting to learn that the natives take readily to these and soon get to use them skillfully. Native teamsters employed on the experimental grounds have learned to operate disk and sulky plows, cultivators, and similar implements very satisfactorily. A machine for thrashing rice which the bureau imported for use on its rice farm has attracted much attention, and there has been considerable demand for its services from native rice growers, who were willing to pay a good toll for having their rice thrashed out by machinery, in preference to hand labor, which otherwise prevails.

The experiment stations and farms in the Philippines are spread over a wide area of country, and embrace a diversity of agricultural interests. The experiment stations proper include those at Malate, just out of Manila; at Batangas, in Batangas Province; at Trinidad, in Benguet Province; and at La Carlota, in Western Negros, where an agricultural college has also been located. The farms include the government farm at San Ramón, in Zamboanga; a rice farm at Murcia, Tarlac Province; and a live stock farm on the Island of Culion. The farms at La Carlota and San Ramón were inherited from the Spanish régime, and were in a generally dilapidated condition when the bureau took hold of them. The San Ramón farm is only 7 degrees removed

from the equator, and is in the midst of tropical surroundings, while the work in Benguet Province has been carried on at a high elevation in a climate so cold that difficulty has been experienced in growing American vegetables. An unusually wide range of climatic conditions is therefore represented by the experiment farms.

The experiment station at Malate, upon which work was begun in October, 1902, comprises about 12 acres of land. It is used largely as a testing ground and for growing improved seeds for distribution. An adequate water supply has been provided and a water tower built, with the necessary pumping and distributing outfits for irrigating during the dry season. Special mention may be made of the experiments at this place with teosinte and Sumatra tobacco. The teosinte was a great success, as will be noted later; and the experiments in growing Sumatra tobacco gave most satisfactory results. The yield of two crops was at the rate of 1,470 pounds to the acre. Plants grown under shade had very thin, elastic, and delicately veined leaves, with a fine silky luster. The great superiority of the shade-grown tobacco was clearly demonstrated.

In Benguet Province the experiments in growing American vegetables and field crops at Baguio have been transferred to Trinidad, four and a half miles distant, and about 900 ft. lower in elevation. The establishment of an experiment station at this point is well under way. In Batangas Province the work at the Batangas Station is devoted chiefly to the growing of forage plants and American vegetables; and at Lipa, in the same province, which lies about 1,000 ft. higher, experiments in the rehabilitation of the coffee industry have been undertaken. A coffee plantation has been established on a tract of about 10 acres, in cooperation with a planter and under the immediate supervision of an expert of the bureau.

Prior to 1891 there were extensive coffee plantations in Batangas Province covering thousands of acres of land, which yielded large incomes to their owners. Since that time the plantations have been almost totally destroyed by attacks of leaf blight and borers, accompanied by almost absolute neglect of the trees and their cultivation. The bureau has imported seed and reared a large number of plants of the Liberian and Maragogype hybrid, which have been successfully transplanted to the thoroughly prepared ground. Experiments will be made in securing resistance to disease and insect injuries by the selection of vigorous-growing varieties and the adoption of the best system of cultivation and treatment.

The agricultural college and experiment station at La Carlota, in Western Negros, was transferred to the Bureau of Agriculture from the Bureau of Education in November, 1902, and a director appointed the following March. This estate, which comprises at present about 2,000 acres, is located in a province where the chief industry is sugar

making. It will be made essentially a sugar station, and devoted mainly to problems connected with the culture and improvement of sugar cane. An appropriation of $15,000 was made for beginning improvements on the farm, and $25,000 has been appropriated for the erection of a main building of brick, to be made on the grounds, which will serve for laboratories, class rooms, offices, and dormitories.

The government farm at San Ramón, in Zamboanga, includes about 5,000 acres, and was formerly used as a penal colony by the Spanish Government. It will be used principally for studying the problems in the management of cocoanut plantations, the preparation of copra, and the culture of abacá (Manila hemp). The farm already has a large number of cocoanut trees in bearing, which have improved in condition since the bureau took charge, and 2,000 additional trees were planted during the year, making a total of 10,700 on the farm. Ground for 8,000 hemp plants was broken during the year, which are reported to be in a thrifty condition. The advantages of cultivation to lessen the damage of drought were abundantly demonstrated on this tract during the season.

The revenues from hemp and copra on this farm amounted during the year to nearly $9,000, and it is thought that by further planting it could be easily made a source of considerable revenue.

The prospects for stock raising as a lucrative industry in the islands are believed to be good, but this will require the exercise of greater care in the prevention of contagious diseases and more attention to the cultivation of forage crops. The industry is at present at a low ebb and there continue to be heavy losses from disease. The stock found in the islands is for the most part of an inferior quality, owing principally to injudicious and careless breeding, lack of care during development, and inattention to feeding.

To aid in developing the industry a stock farm was established on the Island of Culion in January, 1903, after exploring several regions for a suitable location. The farm lies in a large, well-watered valley which affords excellent grazing, and although the island is rather isolated the location is thought to be well suited in all respects for a stock farm. Buildings have been erected for the foreman and laborers, and a stable 24 by 132 ft.; and improved stock of horses, cattle, hogs, milch goats, milch buffalo, and a number of varieties of fowls are being imported to place upon the farm, together with some native stock. The effort of the bureau will be to ascertain the breeds and crosses best adapted to existing conditions, to introduce new breeds of animals for breeding purposes, and to study questions relating to the improvement of the forage supply.

The forage problem is an acute one, and experiments in that line are closely connected with the development of animal industry. The

chief forage for cattle and horses in the cities and towns is grass cut fresh each day, and sold by local dealers to supply the daily needs. The most common kind of grass grown for this purpose, called zacate, is extensively cultivated in the vicinity of Manila, being grown in shallow water in paddies very similar to those prepared for rice culture. Nowhere in the Philippines is any attempt made to produce hay, although it is thought that hay farms in the vicinity of Manila would be both successful and profitable.

Teosinte has proved very productive and profitable as a forage crop, and is thought to give great promise for that country. From experiments at the Malate Station it is estimated that on well-fertilized land with frequent irrigation, ten cuttings could be obtained in a year, yielding over 100 tons of green fodder or approximately 30 tons of dry fodder per acre. The crops grown by the bureau were sold green in Manila at $10 (gold) per ton. Where the seed was allowed to mature an abundant crop was produced, yielding at the rate of 800 pounds of cleaned seed per acre during a dry season; and it is thought that two and probably three crops of seed could be grown annually, which would give a return for seed alone of over $1,400 an acre.

Several varieties of Indian corn have been grown in the islands for many years, but little attention is paid to its culture and care, and the returns are light. It is used mostly as a human food, but nothing is known of the many methods of preparing it for food in the United States. American varieties have shown a tendency to dwarf and ear out close to the ground. Promising results, however, have been secured from the second generation of seed in Batangas, the crop being in considerable contrast to that grown from native seed. The indications are that the use of acclimated American seed will increase the yield one-fourth or more, and that proper cultivation will bring about an increase of an additional one-fourth, thus adding fully 50 per cent to the present output without increase of either acreage or farm labor.

The consumption of rice—the staple article of food for the Filipinos—is estimated at approximately 5,000 tons a day, which is far in excess of the amount produced in the islands. Last year ten million dollars' worth were imported. The Bureau of Agriculture believes that with more extensive culture of rice and the use of modern methods of cultivation the islands are capable of producing not only their own supply but a large surplus for exportation. Steps were taken during the year to secure land and establish a rice farm for the introduction of machinery and better methods. The farm is located at Murcia, Tarlac Province, on the line of the Manila and Dagupan railroad, and embraces about 1,800 acres. About 1,000 acres were put in shape for planting and for irrigation, and were seeded with an American drill. The crop was cut with a reaper and binder, similar to the methods followed in Louisiana and Texas, and was thrashed out

with a rice thrasher of the latest American make. The most approved methods of rice culture will be followed on this farm, which is expected to serve not only as a demonstration farm, but to yield considerable revenue also.

Professor Scribner points out some of the opportunities and some of the needs of agriculture in the Philippine Islands. Manila hemp, the product of abacá, is known the world over, and is the most important source of revenue and the leading industry of the archipelago. The reasons for its prominence are found in the existing natural and industrial conditions. With the development of other forms of agriculture it is believed that the crude methods in practice will have to be improved upon. A more careful selection of the species of hemp grown and better methods of culture would greatly increase the yield of merchantable fiber. In the extraction, drying, baling, and transportation of the fiber there is also opportunity for great improvement, and it is believed that the perfection of a machine for stripping and cleaning the hemp fiber would aid more than any other one thing in developing the industry. Up to the present time no practical machine has been devised for this purpose, and the work continues to be done by hand, resulting in great variation in the quality, color, length, and texture of the fiber, as well as difficulty in securing the necessary labor.

Sisal hemp forms an article of considerable commercial importance in some sections, and will grow in regions entirely unsuited to abacá and upon soils otherwise of little value. The opportunity for extending the industry and for importing suitable machinery for extracting the fiber is thought to be unusually good.

The preparation of copra from the meat of the cocoanut, which is a staple article for export, is carried on in many places by exceedingly crude methods, the drying being done over pits or ovens dug in the ground which are little less than smokehouses. The method is thought to be in urgent need of improvement, and it has been suggested that desiccators or ovens especially constructed for this purpose could be introduced to great advantage.

From this brief outline it will be seen that in the short period of its existence the Bureau of Agriculture has accomplished a very creditable amount of work in agricultural exploration, experimentation, and investigation. It has been somewhat restricted by the limitations of its organization, since all work of a scientific character requiring laboratory equipment is assigned to the Bureau of Government Laboratories. Under this provision the studies of diseases of plants and animals, the composition of crops and agricultural products, and similar problems which require laboratory investigation are without the domain of the Bureau of Agriculture. The botanical work, which was in its charge

during the first year, was transferred to the Bureau of Government Laboratories last summer. The work on rubber production appears also to be assigned to that bureau.

This division of the work into the practical and the scientific, or that of the field and the laboratory, will call for the most cordial cooperation between the two bureaus. Such cooperation will be essential to the rounding out of the work in agriculture, and the efficient investigation of the various scientific phases which are sure to develop as the work progresses.

Some time ago it was mentioned that the Department Library had undertaken the preparation of a card index of the articles contained in the more important scientific periodicals devoted to agriculture. This undertaking is in line with the suggestion of the Committee on Indexing Agricultural Literature and is intended as an aid in looking up the investigation on a given subject.

Considerable progress has been made in this work and the Library is now ready to begin issuing the cards. A circular has been distributed explaining the scope and cost of the index and as soon as returns are received showing the number of subscribers the printing of the cards will begin.

Subscriptions will be received for complete sets, including author and subject cards, for author sets alone, or for the cards relating to any particular subject, as soils or horticulture, or animal production or entomology; and furthermore, a single card or a set of cards for any particular article may be purchased. The "author entry set" will include one card only for each article listed. As the articles are frequently quite broad in their scope and might be classified under several subject headings, and as the index is analytical, additional cards will be required to make up the complete set. The cards in the author set will be sold at one cent each, and the additional cards for making the complete set at one-half cent each.

For the cards subscribed for in a particular class, as soils or entomology, a charge of two cents will be made for the first card and one-half cent for each duplicate card, as considerable more work will be involved in making up such sets. The scheme of subjects from which selection may be made follows in general the classification of the card index issued by this Office, although some changes have been made to better suit it to this particular purpose. Single cards or a set of cards for any article can be purchased at the regular price of two and one-half cents for the first card and one-half cent each for duplicates.

In beginning the preparation of these cards three prominent journals devoted to agricultural science were selected, and the work in analyzing them has progressed to a point where a considerable number of volumes have already been covered and an estimate secured of the

number of entries which will be involved. For the set of *Annales de la Science Agronomique*, from 1884 to 1903, the author set will include 328 cards, costing \$3.28, and the complete set (with author set) will include 844 cards, costing \$5.92. The 31 volumes of *Landwirtschaftliche Jahrbücher*, covering the period from 1872 to 1903, will require 838 cards for the author set, costing \$8.38, and 2,500 cards for the complete set, costing \$17. Similarly, for *Die landwirtschaftlichen Versuchs-Stationen* from 1859 to 1903, 1,378 cards will be required for the author set, costing \$13.78, and 4,100 cards for the complete set, costing \$27.

The form adopted for the printed card leaves the classification to the individual, so that the scheme is very elastic both in the matter of classification and of purchasing the cards. The card for a particular article will contain the name of the author, the exact title of the article in the original language, the reference to the page and number of the journal, and in small type at the bottom, the principal subject or subjects covered by the article. The latter is merely suggestive and is intended as an additional guide to the contents of the article, as the title is frequently not sufficiently definite.

No free sets will be distributed either to libraries or individuals. The price charged is barely sufficient to cover the cost of printing and distribution. If a sufficient number of sets are subscribed for in advance, this mechanical work will be undertaken by the Library of Congress as a part of its card distribution work, although the preparation of the index will remain in the Department. Prospective subscribers are requested to communicate promptly with the Department Librarian in order to hasten the printing of the cards, and notice will be sent out when they are ready for delivery regarding the proper method of payment.

While the cost for the complete sets of cards is considerable, it should be borne in mind that the labor of preparing these cards is contributed by the Department Library, and that no private concern would be warranted in attempting the work. The cost of complete sets of cards for the three serial publications noted above is approximately \$50, but these sets cover 108 volumes with over 2,500 articles, and include nearly 7,500 cards. Other periodicals are to be taken up later as the work progresses, beginning in each case with the earlier volumes. The value of this index to the investigator will be readily appreciated. It constitutes one of those bibliographic helps which no experiment station or large well-equipped agricultural library can afford to be without.

The issuing of a list of current experiment station publications has been commenced by this Office, and the first number has brought many expressions of approval and commendation. The list will be

issued bimonthly in future, and will contain brief synoptical notes regarding each publication listed. It will be in the form of the monthly list of publications of this Department, which it will supplement so far as the station reports and bulletins are concerned. The latter are now so numerous that few people can expect to receive them all, and moreover the widespread distribution of complete files would result in the waste of many bulletins. The new list will enable farmers' institute workers, agricultural editors, various specialists, and others interested in the work of the stations to select such bulletins as are of particular interest and value to them.

In order that the list may be issued promptly and may be complete, it is very desirable that the experiment stations should send copies of their publications to this Office as soon as issued. The plan at present followed at some stations of sending out several bulletins together frequently results in considerable delay. The adoption of a uniform plan of mailing the separate bulletins to the Office as soon as they are received from the printer, would materially facilitate not only the preparation of the new list, but the review of the station work in general.

NEW DAIRY BARN AT THE KENTUCKY STATION.

D. W. May.

Kentucky Experiment Station.

The new dairy barn at the Kentucky Experiment Station is an adaptation of the Swiss style of architecture of deep, overhanging eaves (Pl. II). The building consists of a main portion of two stories and a basement, 68 ft. long by 37 ft. wide, two ells each 60 ft. long, and a milk room 14 by 22 ft. (fig. 8).

The basement underlying the entire main portion of the barn has a natural limestone bottom. This space is used for the heating plant, the storage of ice, etc. The barn is lighted by electricity, and a motor is to be installed for power. The first floor of the main portion contains two offices, a dairyman's room, bathroom, and feed room. This floor is ceiled throughout with hard pine, natural finish. The second story is used for the storage of hay and grain feeds, the grain bins being connected with the feed room below by chutes.

The cow stable, in one of the wings, is 60 by 39 ft., with a loft above for the storage of hay and bedding. The floor is cemented with cement plaster extended on the walls to a height of 4 ft. all around. The remainder of the walls and ceiling are finished in hard pine and varnished. Stalls (Pl. II) are fitted up to accommodate 30 cows. These are constructed of gas pipe embedded in the cement floor, and the upper spaces being fitted with 2-inch netting made of No. 9 wire. The objects in view in the stall construction were to have as little material as possible for necessary protection of the animals, and at the same time to economize the available space. The animals are fed from galvanized iron troughs 14 in. wide and extending across the front of the stalls. A drop 18 in. wide runs the length of the stalls in the rear. The manure is handled with a Cherry carrier running on an overhead track behind the stalls. It is taken directly to the fields and spread at once or as soon as the ground may be traversed. The cows are tied with a single rope.

The second ell is 60 by 27 ft., with a clay floor, and is ceiled throughout. It is divided into box stalls built of oak. Two are solid and high, to be used for bulls or sick animals. The remainder are made of oak palings 4 ft. high, fitted with stanchions for holding calves

FIG. 1.—EXTERIOR VIEW OF KENTUCKY STATION DAIRY BARN.

FIG. 2.—VIEW OF COW STALLS OF KENTUCKY STATION DAIRY BARN.

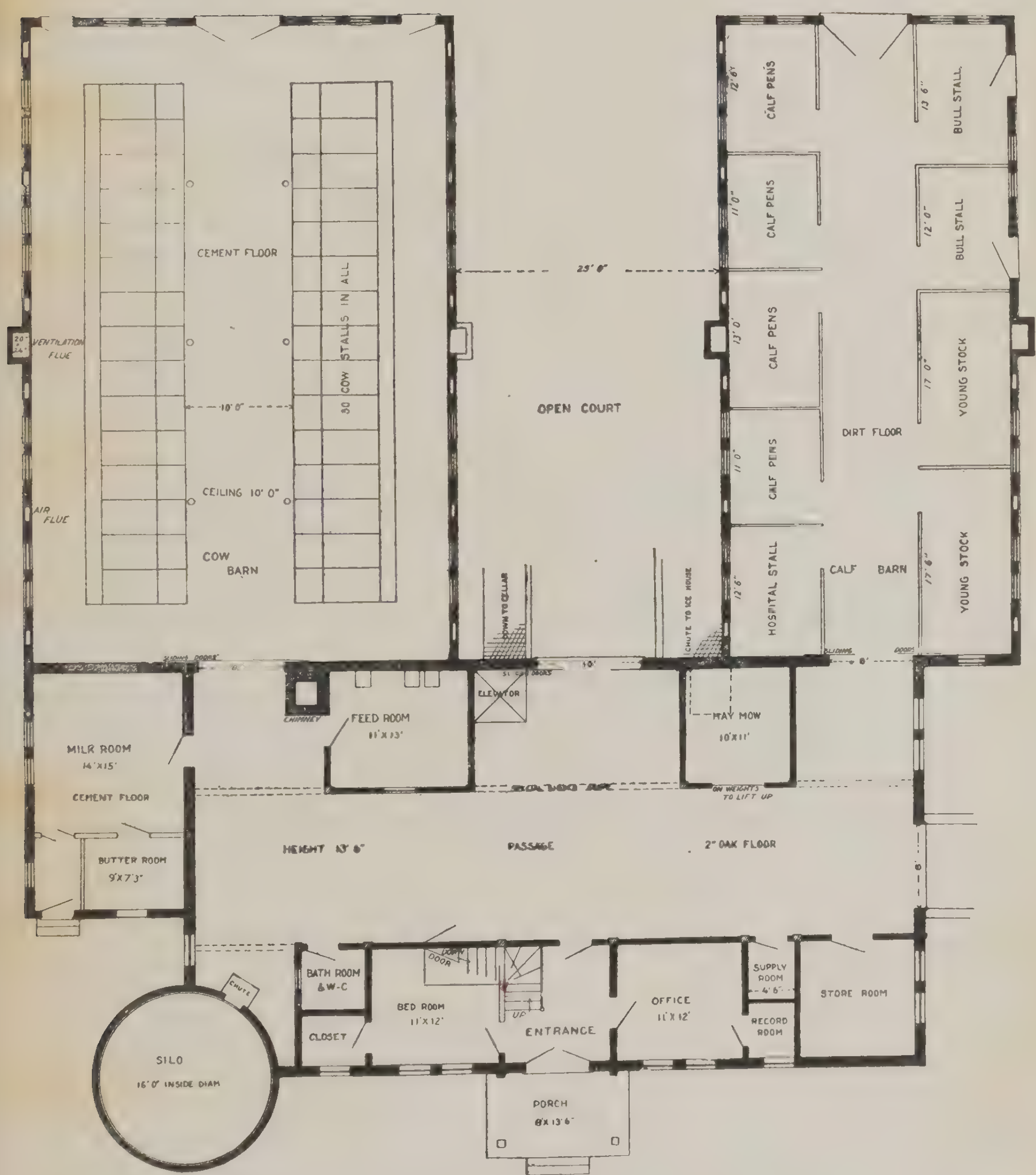

FIG. 8.—Ground plan of Kentucky Station dairy barn.

while they are being fed. A system of ventilation is provided for both wings, illustrated in figure 9.

The milk room is cemented throughout on steel lath. It is fitted with slate shelving, porcelain basins, and nickeled trimmings, so that it may be sterilized readily with hot water or steam.

The silo at one corner of the building is 38½ ft. high by 16 ft. in

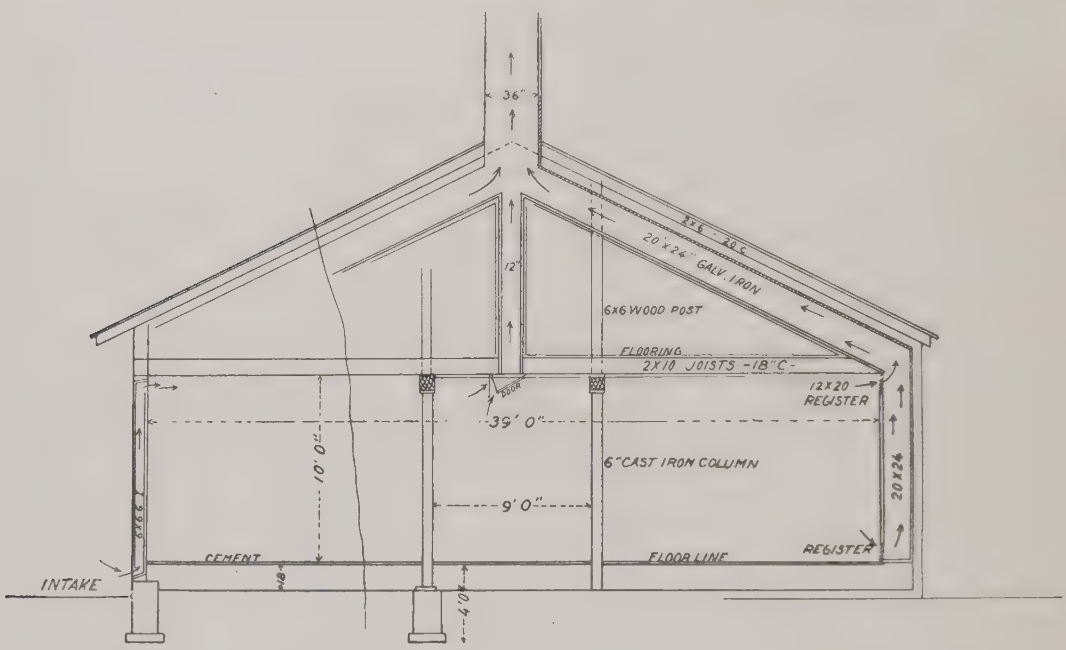

FIG. 9.—Ventilation system of Kentucky Station dairy barn.

diameter. The outside is weather boarded like the barn, and the interior lining is constructed of two sheathings of seven-eighths in. shiplap siding, with two layers of tarred paper between.

The cost of the barn complete, including stalls and plumbing, was approximately $8,500.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of citric-acid soluble phosphoric acid in Thomas slag, P. Wagner et al. (*Die Bestimmung der zitronensäurelöslichen Phosphorsäure in Thomasmehlen. Berlin: Paul Parey, 1903, pp. VII + 112*).—This is the first of a series of contributions from the Association of German Agricultural Experiment Stations, which are designed to summarize in concise form lines of investigation by the German stations which have led to conclusive results of practical value. This number reviews the history of the development of the German official method of determining the solubility of the phosphoric acid of Thomas slag in citric acid, explains in detail the sources of error and the precautions to be observed in using the method, and gives a full description of the method and of the preparation of the reagents required.

Investigations on phosphorus and phosphoric acids, H. Giran (*Ann. Chim. et Phys., 7. ser., 30 (1903), Oct., pp. 203–288, figs. 6*).—This article deals in a somewhat exhaustive manner with the different forms, heat of combustion, and solubility in bromin of phosphorus; forms and properties of phosphoric anhydrid; and preparation and properties of metaphosphoric and pyrophosphoric acids and the rapidity of their transformation in solution.

Solubility of magnesium ammonium phosphate in ammonium citrate, A. Bolis (*Chem. Ztg., 27 (1903), No. 94, p. 1151*).—By treating 2 gm. of freshly precipitated magnesium ammonium phosphate with 100 cc. of neutral ammonium citrate containing 400 gm. of citric acid per liter for 24 hours in the cold, it was found that the average solubility of the phosphate was 0.457 per cent. When the solution was kept warm during the treatment the solubility was somewhat higher, approximately 0.6 per cent.

The influence of ammonium salts in preventing the precipitation of magnesium by means of ammonia, F. P. Treadwell (*Ztschr. Anorgan. Chem., 37 (1903), No. 2, pp. 326–331; abs. in Chem. Ztg., 27 (1903), No. 93, Repert. 21, p. 299*).—The author's investigations confirm Lovén's conclusion that the action of ammonium salts in preventing the precipitation of magnesium by means of ammonia is due not to the formation of complex salts, but solely to the prevention of dissociation of ammonium hydroxid by ammonium chlorid according to the law of mass action.

On the quantitative separation of lime and magnesium by the indirect method, A. C. Christomanos (*Ztschr. Analyt. Chem., 42 (1903), pp. 606–612; abs. in Chem. Centbl., 1903, II, No. 20, p. 1145*).—Methods applicable to mineral waters and magnesite are described. These are based upon the conversion of the calcium and the magnesium after the removal of silica, iron, and alumina from the solution, first into carbonate and then into sulphate. A method of estimating the lime and magnesia from the weights of carbonate and sulphate obtained, with proper factors to use, is explained, and results of analyses of a number of samples of magnesite are reported.

A contribution to the knowledge of calcium carbonate, W. Meigen (*Ber. Naturf. Gesell. Freiburg, 13 (1903), July, pp. 40–94, figs. 9*).—A detailed and technical chemical study.

Detection and estimation of ammonia by means of sodium picrate, C. Reichard (*Chem. Ztg., 27 (1903), Nos. 80, pp. 979, 980; 82, pp. 1007, 1008; abs. in Jour. Chem. Soc. [London], 84 (1903), No. 493, II, p. 754*). In the method proposed

the ammonium salt (chlorid or sulphate) is dissolved in the smallest possible quantity of cold water. The solution is then heated to boiling and mixed with an excess of boiling 10 per cent solution of sodium picrate. The liquid is allowed to cool gradually, and when quite cold is decanted, the portion adhering to the crystals being removed by means of filter paper. The crystals are then dried at 60 to 70° C. and weighed. Carbonates, cyanids, and compounds of potassium, rubidium, and caesium (but not of lithium) interfere with this reaction.

A method for the determination of ammonia, A. SCHITTENHELM (*Ztschr. Physiol. Chem., 39 (1903), p. 73; abs. in Chem. Ztg., 27 (1903), No. 81, Repert. 18, p. 251*).—A modification of the Krüger-Reichs method, adapted to clinical purposes, is described.

Estimation of nitrates in waters by the Schultze-Schloesing method, L. L. DE KONINCK (*Bul. Assoc. Belge Chim., 17 (1903), pp. 117–120; abs. in Chem. Centbl., 1903, II, No. 7, pp. 461, 462; Jour. Chem. Soc. [London], 84 (1903), No. 493, II, p. 754*).—In this method the gas evolved by the action of hydrochloric acid and ferrous chlorid is collected over potassium hydroxid and the resulting nitric oxid is finally measured over water. The author, however, prefers to first decompose the carbonates. It was found that bromids do not interfere with the reaction. In estimating silica in water containing nitrates the author prefers to acidify with sulphuric acid instead of hydrochloric acid, especially when a platinum dish is used.

On the determination of nitrate nitrogen in presence of organic nitrogen, T. PFEIFFER (*Ztschr. Analyt. Chem., 42 (1903), No. 9–10, pp. 612–617; abs. in Chem. Centbl., 1903, II, No. 20, p. 1145*).—Referring to a recent article by Liechti and Ritter (E. S. R., 15, p. 121), the author reports further studies of the accuracy of Schloesing's method, which bear out his conclusions drawn from previous investigations, that the presence of ammonium salts and organic compounds of nitrogen seriously interfere with the accuracy of this method, causing the results to be too low.

The determination of nitrogen by the Kjeldahl method, R. B. GIBSON (*Jour. Amer. Chem. Soc., 26 (1904), No. 1, pp. 105–110*).—Owing to the recent discussion of the reliability of the Kjeldahl method for the determination of nitrogen in organic compounds, the author made control determinations of nitrogen in uric acid, hippuric acid, tyrosin, leucin, urethane, thiourea, phenylmethyloxypyrimidin, aminobenzoic acid, and caseinogen by the Kjeldahl-Gunning method.

The results are believed to afford no occasion to question the usefulness or accuracy of the the Kjeldahl method as applied to physiological-chemical work. It is stated that "when due care is exercised to procure a proper decomposition and oxidation of the substances analyzed, uniformly satisfactory determinations can readily be obtained. For substances of unknown structure, however, the results furnished by the Kjeldahl process should not be accepted without verification by other methods."

The results of recent investigations in proteid chemistry, P. A. LEVENE (*Science, n. ser., 19 (1904), No. 472, p. 106*).—A brief note on a paper presented by the author at a meeting of the Society for Experimental Biology and Medicine, calling attention to the results of some of the more recent work on the chemistry of proteids, which is of especial interest as explaining biological phenomena.

On vegetable protein, O. NAGEL (*Jour. Soc. Chem. Ind., 22 (1903), No. 24, pp. 1337, 1338*).—Notes are given on the preparation of vegetable albumin from certain oil cakes, of which sesame and rape seed are preferred, and of vegetable casein from soy beans.

A new Kjeldahl apparatus, M. VOGTHERR (*Chem. Ztg., 27 (1903), No. 80, pp. 988, 989; abs. in Chem. Centbl., 1903, II, No. 20, p. 1141*).

Phosphomolybdic acid as a reagent for the detection of the amino group, F. SEILER and A. VERDA (*Chem. Ztg., 27 (1903), No. 91, pp. 1121–1125*).

Provisional methods of the Hawaiian Sugar Chemists' Association (*Honolulu: Hawaiian Gazette Co., Ltd., 1903, pp. 10*).—This contains the provisional methods of the association for the analysis of sugar cane, bagasse, waste molasses, and press

cake, compiled and edited by the executive committee. Forms for analytical reports are appended.

On the polyrotation of sugars, E. ROUX (*Ann. Chim. et Phys., 7. ser., 30 (1903), Nov., pp. 422–432*).

Notes on the hydrolysis of starch by acids, G. W. ROLFE and H. W. GEROMANOS (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1003–1014, dgm. 1*).—The conclusion was reached by Rolfe and Defren in work published in 1896 (E. S. R., 9, p. 22), that a constant relation exists between optical rotation and copper reduction; or, in other words, that products of hydrolysis of the same rotation have the same reducing power. The results of this work as recalculated, and additional data obtained in an investigation of hydrolyzed products of several commercial starches, are reported. The results are believed to show conclusively the presence of another reducing body than dextrose in acid-hydrolyzed starch products.

The presence of maltose in acid-hydrolyzed starch products, G. W. ROLFE and I. T. HADDOCK (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1015–1019, pls. 6*).—Maltosazone was separated from alcoholic fractions of commercial glucose solutions. The method used is to be further investigated. Incidentally the relation of optical rotation to cupric reduction as applied to alcoholic fractions was tested, the relation being found to agree in general with that for homogeneous acid-hydrolyzed products.

A study in raffinose determinations, D. L. DAVOLL, Jr. (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1019–1028*).—Several methods of determining raffinose in the presence of saccharose were tested. A modification of Clerget's method proposed by the author is believed to give satisfactory results with dark-colored products. The modification consists in the addition of 1 gm. of powdered zinc for 3 to 4 minutes at 69° C. after the completion of inversion by the method of Clerget.

Butter and butter substitutes, P. SCHWEITZER (*Columbia, Mo.: pp. 28*).—In this investigation into the chemical properties of fats used as articles of food, 31 samples were examined. Notes are given on the methods of analysis used, and the results are discussed in detail. The data are summarized in the following table and the author's conclusions are quoted below:

Analyses of fats and oils.

	Hübl number.	Reichert-Meissl number.	Köttstorfer number.	Hehner number.	Index of refraction.	Fuel value.
						Calories.
Butter	27.8	32.0	229.9	87.02	1.4587	9,287
Do	28.8	29.2	230.1	86.86	1.4582	9,298
Do	28.0	19.9	225.6	87.38	1.4597	9,183
Do	37.8	27.8	225.3	88.62	1.4603	9,245
Do	41.1	25.7	226.6	88.37	1.4613	9,471
Do	31.0	28.0	224.5	88.35	1.4600	9,400
Do	28.9	28.8	230.7	88.13	1.4579	9,364
Butterine	48.3	6.1	207.3	94.52	1.4637	9,534
Do	49.9	1.6	205.6	94.57	1.4657	9,544
Do	57.9	.4	203.2	94.71	1.4671	9,612
Do	44.8	6.0	203.8	94.70	1.4636	9,573
Do	47.9	1.2	202.0	94.69	1.4658	9,584
Do	61.1	.4	199.3	94.95	1.4662	9,649
Oleo oil	45.0	.4	205.2	93.75	1.4633	9,541
Do	45.2	.4	204.2	93.73	1.4630	9,572
Neutral lard	59.5	.5	196.2	95.12	1.4651	9,686
Do	58.6	.4	195.6	95.10	1.4650	9,704
Cotton oil	101.9	.3	192.4	95.89	1.4703	9,518
Do	106.2	.5	195.5	96.00	1.4697	9,625
Do	109.4	.6	195.6	95.72	1.4704	9,370
Do	110.1	....	193.2	....	1.4706	9,815
Do	108.5	....	194.5	....	1.4707	9,803
Beef stearin	22.3	....	197.3	95.67	....	9,564
Do	20.3	....	198.2	95.75	....	9,486
Lard stearin	47.6	....	201.5	95.69	1.4645	9,590
Do	42.1	....	200.6	95.51	1.4644	9,540
Lard oil	73.4	.7	196.1	95.57	1.4664	9,803
Do	68.6	.6	195.5	95.71	1.4663	9,785
Peanut oil	101.5	.3	190.6	95.78	1.4696	9,575
Sunflower oil	128.5	.7	190.3	95.45	1.4748	9,808
Olive oil	83.2	.6	191.1	95.45	1.4647	9,504
Corn oil	....	....	....	95.50	1.4727	....

"As this study was undertaken chiefly to answer the question whether certain fats used as food by man could be distinguished one from the other, I would say that butter, oleo oil, neutral lard, cotton-seed oil, beef stearin, lard oil, and any of their mixtures, whether called butterine or by any other name, can be distinguished one from the other with perfect certainty, and that in mixtures, even those containing a certain proportion of butter, the nature of the components can be ascertained with a reasonable degree of accuracy."

The iodin number of cotton-seed oil, peanut oil, and some other oils and fats, J. J. A. Wijs (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 15, pp. 692–697*).—Determinations made by the author's method of the iodin absorption of a number of samples of oils and fats are reported.

Readings on the Zeiss butyro-refractometer of edible oils and fats, H. C. Lythgoe (*Tech. Quart., 16 (1903), No. 3, pp. 222–226*).—The author reports actual readings of cocoanut oil, beef stearin, cacao butter, beef tallow, mutton tallow, lard stearin, beef oleo, lard oil, peanut oil, rape-seed oil, yellow and black mustard oils, sunflower oil, and poppy-seed oil, most of the samples being of known purity. A table is given, in which the calculated readings of these oils and fats at different temperatures are incorporated with the butter readings of Zeiss, the lard readings of Hefelmann, and the olive oil and cotton-seed oil readings of Leach. The iodin number and specific gravity of beef stearin, lard stearin, beef oleo, and lard oil are also reported.

Acido-butyrometric analyses of whey, P. Wieske (*Rev. Gén. Lait, 3 (1903), No. 2, pp. 30–34, fig. 1*).—The Adams, Gottlieb, and Gerber methods of determining fat were compared on 16 samples of whey. Duplicate determinations by the Gerber method showed no greater variations than by the gravimetric methods. The results of the 3 methods agreed closely.

The determination of fat in skim milk, C. Barthel (*Rev. Gén. Lait, 3 (1903), No. 2, pp. 25–29*).—The Adams and Gottlieb methods were compared on whole and skim milk. The Adams method gave too low results in the case of skim milk obtained from milk subjected to considerable agitation before separation, while the Gottlieb method was believed to give reliable results under all circumstances.

Determination of fat in milk by the Adams, Gottlieb, and Gerber methods, M. Siegfeld (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 6, pp. 259–271*).—A large number of duplicate determinations by each of these methods, extending over a number of years, are reported. No more accurate results are believed to be obtained by one of the methods than by another. The possible sources of error in each method are pointed out.

Investigations on the Gottlieb-Rose method of fat determination, M. Popp (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 1, pp. 6–12*).—According to the author's experience the Gottlieb-Rose method is simpler, shorter, and more accurate than other gravimetric methods of determining fat in milk. In one series of experiments a study was made of the effect of allowing the sample to stand for varying periods, from ½ to 6 hours, after the addition of the ammonia, alcohol, ether, and petroleum ether. About 1 hour is recommended.

In another series of experiments comparison was made of ammonia of different concentrations (sp. gr. 0.98 to 0.91, corresponding to NH_3 4.8 to 24.99 per cent). The result showed no greater variations than with the use of the concentration (sp. gr. 0.96) recommended by Gottlieb. Practically the same figures were obtained by the weakest ammonia and double the usual amount of the strongest ammonia used.

Qualitative reactions of hydrogen peroxid and their use in the examination of milk, C. Arnold and C. Mentzel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 7, pp. 305–309*).—The different tests for hydrogen peroxid are mentioned and their application to the detection of this substance in raw and heated milk is briefly described.

New reactions for distinguishing raw and heated milk, as well as for the detection of hydrogen peroxid in milk, C. ARNOLD and C. MENTSEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 12, pp. 548, 549*).—Characteristic color reactions are reported as obtained by 2 aromatic amins, p-diethyl-p-phenylenediamin and p-diamido-diphenylaminhydrochlorid.

The examination of milk samples containing unduly large quantities of preservatives, M. SIEGFELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 9, pp. 397–408*).—Fat was determined by the Gerber method in milk containing various quantities of formalin and potassium bichromate. The results were materially influenced by large quantities of these preservatives.

A comparative study of methods of determining formaldehyde, B. H. SMITH (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1028–1035*).—The Blank and Finkenbeiner method of determining formaldehyde was found very satisfactory for strong solutions. The Legler method gave lower results but was fairly satisfactory. The gravimetric hexamethylenetetramin method was considered practically worthless. The iodiometric and potassium cyanid methods gave good results on dilute solutions. It was considered possible to determine with accuracy 1 part of formaldehyde in 100,000 by the potassium cyanid method. In the anilin volumetric method the author found it impossible to ascertain the end point.

The estimation of formaldehyde in milk, B. H. SMITH (*Jour. Amer. Chem. Soc., 25 (1903), No. 10, pp. 1036–1038, dgm. 1*).—Several experiments are reported, the results of which are summarized by the author as follows:

"It may be said that considerable time and trouble may be saved by using a Kjeldahl flask and a round, flat evaporating burner in the distillation of milk; that the quantity of sulphuric acid added has a decided effect upon the amount of formaldehyde obtained in the first part of the distillation; that, if the treated milk is kept in a cool place, the percentage of formaldehyde found will remain practically constant for at least 48 hours; and that where 100 cc. of milk are treated with 1 cc. of sulphuric acid of a dilution 1:3 and distilled, the first 20 cc. of the distillate will contain very close to $33\frac{1}{3}$ per cent of the total formaldehyde present."

A chemical method for detecting and measuring the addition of low-grade flour to wheat flour, G. VOLPINO (*Gior. Farm e Chim., 52 (1903), pp. 337–346; abs. in Chem. Centbl., 1903, II, No. 15, p. 844*).—Contrary to the opinion of other investigators the author maintains that when a mixture of wheat flour and barley, rye, maize, or rice meal is washed out with water by means of a water pump, only gluten possessing the qualities of wheat gluten will remain, and in about the proportion in which wheat gluten is present in the original mixture. The insoluble proteids of barley, rye, maize, and rice meal are found in the water used for washing the gluten, and are removed from the water by filtration. The estimation by the Kjeldahl method of these insoluble proteids obtained after the removal of gluten furnishes information regarding the quality of the flour and the kind and amount of adulteration.

Flour is regarded as adulterated which contains, after the removal of the gluten, more than 0.02 gm. of proteid insoluble in water. The kind of adulteration can be determined usually with a microscope. Spoiled wheat flour shows an increase in the insoluble proteids remaining after removing gluten which is proportional to the degree of change. These insoluble bodies do not equal the amount found in other sorts of flour besides wheat.

Volumetric determinations, A. WOHL (*Ber. Deut. Chem. Gesell., 36 (1903), pp. 1417–1422; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 22, p. 1230*).—The author explains the application of his method, previously described (E. S. R., 14, p. 1043), to the determination of ammonia and carbon dioxid.

Potassium tetroxalate as a titrating reagent, O. KÜHLING (*Ztschr. Angew. Chem., 16, (1903), pp. 1030–1033; abs. in Chem. Centbl., 1903, II, No. 25, pp. 1390,*

1391).—The author claims that potassium tetroxalate of constant composition can be prepared from oxalic acid which has been carefully purified by crystallization (from hot hydrochloric acid and boiling water), by recrystallizing the tetroxalate obtained on adding potash solution to the oxalic acid, pressing between sheets of hardened filter paper, and allowing to air-dry until the crystals no longer adhere to the sides of a glass vessel. It is pointed out that the difficulty which has often been encountered with this reagent was probably due to the fact that the tetroxalate was prepared by desiccation over sulphuric acid.

On the titration of sulphuric acid with benzidine hydrochlorate, W. J. MÜLLER and H. DÜRKES (*Ztschr. Analyt. Chem., 42 (1903), pp. 477–492; abs. in Chem. Centbl., 1903, II, No. 17, pp. 964, 965*).—The investigations reported are a continuation of previous work (E. S. R., 15, p. 337) and relate to conditions of accuracy and applications of the method to various compounds.

On the impurities in compressed oxygen and their rôle in combustion by means of the bomb calorimeter, M. BERTHELOT (*Ann. Chim. et Phys., 7. ser., 30 (1903), Aug., pp. 433–440, fig. 1*).

The determination of carbon dioxid, A. WOHL (*Ber. Deut. Chem. Gesell., 36 (1903), pp. 1412–1417; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 22, p. 1230*).—The method described is based upon the loss of weight due to the expulsion of carbon dioxid, aqueous vapor generated within the flask being used for the latter purpose. The apparatus employed and the precautions observed to prevent inaccurate results due to absorption of carbon dioxid by condensed aqueous vapor are described.

The determination of argon in atmospheric air, H. MOISSAN (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 16, pp. 600–606*).

On the determination of the composition of chemical compounds without the aid of analysis, G. TAMMANN (*Ztschr. Anorgan. Chem., 37 (1903), No. 2, pp. 303–313, figs. 5*).—The method described is based upon the melting or fusing point and the relation of the properties of the crystallized fusion to chemical composition.

The general principles of physical science, A. A. NOYES (*New York: Henry Holt & Co., 1902, pp. VII+172; rev. in Science, n. ser., 19 (1904), No. 472, p. 102*).

The progress in agricultural chemistry, 1902, A. HILGER, T. DIETRICH, ET AL. (*Jahresber. Agr. Chem., 3. ser., 5 (1902), pp. XXXVI+580*).—This contains abstracts of the more important articles in agricultural chemistry published in 1902, and titles of articles of less importance. The subjects are classified, as usual, under plant production, animal production, agricultural technology, and methods of investigation.

BOTANY.

Acidity of plants, A. ASTRUC (*Ann. Sci. Nat. Bot., 8. ser., 17 (1903), pp. 1–108; abs. in Jour. Roy. Hort. Soc. [London], 28 (1903), No. 1–2, pp. 229, 230*).—An account is given of investigations on the occurrence of free or partially combined acids in different plants, and in different parts of the same plant under varying conditions.

In the case of nonsucculent plants the chief conclusions drawn are that vegetable acids are present in greater quantity in young leaves and diminish as the leaves become older, and that the younger parts of the leaf contain more acid than the more mature parts of the same leaf. The organic acids are gradually fixed by saturation or etherification and disappear as free acids. The production of organic acids is intimately associated with the processes of respiration and assimilation. In the green parts of variegated leaves the acids are more abundant than in the paler parts, and in etiolated plants the acids increase on exposure to light. In the stem the greatest acidity is found in the young growing parts. The acidity of the flowers decreases as development goes on, but begins to increase as the flowers begin to fade. This change is said to be due to the commencement of the growth of the ovary into fruit.

In the second part of the report the investigations are confined to succulent plants. These have long been known to be peculiar in their absorption and excretion of oxygen and carbon dioxid gas, as well as in their acidity. The author has shown that the acidity of these plants, which is chiefly due to malic acid, increases considerably during darkness. In a leaf partly exposed to full sunlight the acid content is distinctly greater in the shaded parts and less in the exposed parts. This disappearance of acids in succulent plants is said to be due not to their fixation, but to the processes of respiration and assimilation. The transpiration of the succulents studied was influenced more by the salts present in the different organs of the plants than by their acid content.

The significance of ethereal oils in xerophytes, C. Detto (*Flora, 92 (1903), pp. 147-199, figs. 7; abs. in Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2, pp. 250, 251*).—The author has examined the functions of ethereal oils in their significance toward desert plants. The theory of Tyndall that they serve to check excessive heating by the opacity of their vapor to ultra-red rays is held to be improbable. Dixon's theory that the function of essential oils is to check transpiration was examined and found to depend on the presence of these oils in the vapor. The author regards the function as protective against many animals, such as mollusks, herbivorous mammals, etc., and justifies his view by a careful series of experiments.

Carbonic acid assimilation in submerged plants, O. Treboux (*Flora, 92* (*1903*), *pp. 77–97; abs. in Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2, p. 239*).—Experiments are reported on Elodea in a dark room illuminated by an incandescent lamp. Various substances were added to the water and the rate of assimilation estimated by counting the gas bubbles given off in 5 minutes.

Assimilation was found to be reduced by the addition of neutral salts, while salts of the heavy metals, alkaloids, and anæsthetics, which in minute proportions increase respiration, had no effect on assimilation. Chloroform was found to arrest assimilation temporarily. All acids when sufficiently dilute not to be harmful increased assimilation. Sufficiently dilute formaldehyde was indifferent to the rate of assimilation, and neither in the presence of light nor in darkness was there any additional starch formed from it. In stronger solutions formaldehyde was found to be injurious.

Growth without oxygen, A. J. Nabokich (*Bot. Centbl., Beihefte, 13* (*1902*), *No. 3, pp. 272–332; abs. in Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2, p. 264*).—A report is given of experiments in growing sunflower hypocotyls in flasks which had been exhausted by an air pump and then sealed. The investigations showed that a distinct elongation is perceptible in the absence of oxygen, and that practically no effect is produced by traces of oxygen where the amount present is less than 0.06 per cent.

The effects of temperature on the individuality and character of the mother plant, of the duration of the experiments, and of the use of sugar solutions or water in the experiments were investigated. It was found that when seeds were germinated in an atmosphere deprived of oxygen there was a reduction of nitric acid, although bacteria were absent from the substrata and from the seeds. The point of interest in the paper is that the anaerobic life followed by many bacteria can be adopted by the cells of higher plants under certain conditions.

The effect of the temperature of the soil on the growth of roots, P. Kossovich (*Zhur. Opuitn. Agron.* [*Jour. Expt. Landw.*], *4* (*1903*), *No. 4, pp. 389–399*).—The experiments reported upon were carried out in vessels having 3 zinc walls and 1 of glass, permitting the examination of the root systems from time to time. Each vessel received the same amount of soil and fertilizer, and the humidity was maintained at 27.3 per cent of the dry soil.

The plants used in the experiments were oats, mustard, and flax; and the different vessels were kept throughout the growing season at different temperatures by placing the vessels in zinc boxes sunk in the ground and the temperature regulated

by warm or cool water. In one series a temperature of 6 to 8° C. was maintained; in the second 12 to 17° C., and in the third 26 to 30° C. The development of the plants proceeded normally. All the vessels were kept in the open air from May 29 to the end of September.

A tabulated report is given of the growth of the different plants, in which it appears that the mustard made the greatest growth at the highest soil temperature, the oats at the medium temperature, and flax at the lowest. The smallest production of the different plants was in the inverse order of the maximum. In regard to the underground development, the weight of the roots of all the plants was found to be greatest in the coolest soil. This was particularly noticeable in the case of the oats. The weight of the roots of the oats in the cooled soil was 21.87 gm., as compared with 14.98 gm. in the warmest, and 17.27 gm. in the medium temperature. From this it is concluded that a soil temperature of from 6 to 9° is the best for the development of the roots of oats.—P. FIREMAN.

The influence of colored glass on the red and yellow pigments in plants, E. LAURENT (*Rev. Hort. Belge, 28 (1902), No. 11, p. 243; abs. in Jour. Roy. Hort. Soc. [London], 28 (1903), No. 1–2, p. 244*).—Experiments are reported with *Telanthera versicolor* of a pronounced red foliage in frames with red and blue glass. None of the glasses was monochromatic. Under the red and blue glass the leaves all became green, and after a month's interval the leaves produced were smaller than normal. A variety of Coleus, with large leaves, green at the base and reddish-violet toward the tips, bore normal leaves under clear glass, but under the red and blue glass the leaves were diminished and the colored parts became more and more reduced, while the flowers were green. Similar results were obtained with a number of other plants. A zonal pelargonium became entirely green under the red and blue glass.

The results of the experiments show that a brilliant light favors high coloration of foliage, as can be shown in purple-leaved trees, the coloring matter of the leaves being dependent upon their assimilation. Trees and shrubs with golden leaves when poorly illuminated became green. Red glass induced etiolation in some species, and under the blue glass the stems of many were decidedly shortened. These experiments are said to show that the yellow pigment of the foliage is a product of assimilation.

The influence of Aspergillus niger on the transformation of the albuminoids in peas, I. S. KOSYACHENKO (*Zhur. Opuitn. Agron. [Jour. Expt. Landw.], 4 (1903), No. 4, pp. 439–449*).—Since 1896 the hygienic laboratory of the Kharkov Veterinary Institute has conducted investigations relative to the transformation of the nitrogenous substances in various fodder products which were infested with molds. These investigations have shown that, in the development of molds on grain products containing in their composition more than 10 per cent proteid substances, simultaneously with the decrease of the total quantity of nitrogenous substances there is a decrease of the true albuminoid substances.

A quantitative analysis of the products of decomposition under the influence of molds was made, the studies being carried on with ground peas subjected for 64 days to cultures of *Aspergillus niger*. The products of the decomposition of the proteid substance of the peas under the influence of pure cultures of the fungus were found to be tyrosin and leucin, and various hexose bases such as arginin, lysin, etc.—P. FIREMAN.

The physiological principles of plant culture, C. KRAUS (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), Nos. 5, pp. 180–200; 6, pp. 220–236; 7, pp. 268–279; 9, pp. 342–367*).—A discussion is given of the principles of plant growth, breeding, and improvement as illustrated with beets.

Poisoning by Lepiota morgani, F. L. STEVENS (*Jour. Mycol., 9 (1903), No. 68, pp. 220–222*).—An account is given of the injurious effect on the author of this mushroom, which is frequently considered as edible. The symptoms produced by the

eating of a small portion of a freshly picked specimen are described at some length.

The conservation and cultivation of medicinal plants, H. KRAEMER (*Amer. Jour. Pharm., 75 (1903), No. 12, pp. 553–569*).—Classifications are given of plants yielding drugs and it is shown that about three-fourths of all the medicinal plants are either growing wild or in cultivation in this country. Of the remaining one-fourth probably one-half could be grown in this country, leaving but a comparatively small number of plants that could not be economically grown.

METEOROLOGY—CLIMATOLOGY.

Meteorological observations, J. E. OSTRANDER and F. F. HENSHAW (*Massachusetts Sta. Met. Buls. 178, 179, 180, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during October, November, and December, 1903. The general character of the weather of each month is briefly discussed and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure [a] (inches).—Maximum, 30.70, November 21; minimum, 28.93, February 17; mean, 29.996. *Air temperature* [b] (degrees F.).—Maximum, 97, July 9; minimum, −12, January 20; mean, 46.7; mean sensible (wet bulb), 43; maximum daily range, 45, February 21, March 14, May 12; minimum daily range, 3.5, June 15, October 11; mean daily range, 21.7. *Humidity.*—Mean dewpoint, 37.6; mean relative humidity, 73.5. *Precipitation.*—Total rainfall or melted snow, 45.45 in.; number of days on which 0.01 in. or more rain or melted snow fell, 116; total snowfall, 33.5 in. *Weather.*—Total cloudiness recorded by sun thermometer, 2,328 hours, or 52 per cent; number of clear days, 119; number of fair days, 98; number of cloudy days, 148. *Bright sunshine.*—Number of hours recorded, 2,126, or 48 per cent. *Wind.*—Prevailing direction, west southwest; total movement, 46,256 miles; maximum daily movement, 402 miles, April 17; minimum daily movement, 4 miles, August 27; mean daily movement, 126.7 miles; maximum pressure per square foot, 22 lbs., February 12, W. *Dates of frost.*—Last, May 2; first, September 25. *Dates of snow.*—Last, April 4; first, October 26.

Central meteorological observatory of Mexico, M. E. PASTRANA (*Bol. Sec. Fomento [Mexico], 2. ser., 3 (1903), No. 6, IV, pp. 99–126, pls. 3, dgm. 1*).—A report on meteorological observations during the months of July, August, and September, 1902.

Meteorology of Tunis, G. GINESTOUS (*Bul. Dir. Agr. et Com. [Tunis], 8 (1903), No. 29, pp. 519–532*).—A detailed summary is given of observations during the summer (June, July, and August) of 1903 at 42 different places in Tunis on pressure, temperature, rainfall, humidity, cloudiness, direction of the wind, and miscellaneous phenomena. The average temperature for the summer of 1903 is compared with that of previous years, in some cases extending as far back as 1885.

Meteorology of British Guiana, J. B. HARRISON (*Rpt. Agr. Work Bot. Gard. [British Guiana], 1902–3, pp. 3–5*).—A record is given of the rainfall and duration of sunshine at the government laboratory, Georgetown, during the 18 months ended June 30, 1903. The record includes not only measurements of the rainfall, but its contents of chlorin and of nitrogen in the form of ammonia and nitric acid. The rain which fell during the period referred to contained 244 lbs. of chlorin, equal to 402 lbs. of common salt per acre, and 4.67 lbs. of combined nitrogen, equivalent to 22 lbs. of ammonium sulphate. For the year ended June 30, 1903, the figures were 3.1 lbs. combined nitrogen and chlorin, equivalent to 205 lbs. of common salt per acre. The total rainfall for the same period was 98.9 in.

Meteorological observations in Rhodesia, G. DUTHIE (*Rpts. Administr. Rhodesia, 1900–1902, App., pp. 103–124*).—A summary is given of observations on atmos-

[a] Reduced to freezing and sea level. [b] In ground shelter.

pheric pressure, temperature, rainfall, and direction of the wind during 1900–1902 at a number of places in different parts of Rhodesia.

Weather conditions of South Australia, A. J. PERKINS (*Rpt. Min. Agr. South Australia, 1903, pp. 5, 6*).—A tabular summary is given which shows the distribution of rainfall over the agricultural districts of South Australia during 1902 as compared with previously recorded means.

Normals of the air pressure reduced to 32° F. and constant gravity, latitude 45, J. ELIOT (*Indian Met. Memoirs, 16 (1903), pt. 1; rev. in Science, n. ser., 19 (1904), No. 472, pp. 115, 116*).—"The memoir includes the monthly and annual means of the barometric observations at all observatories in India which have been in operation at least 20 years. At most of the observatories the observations date from 1875, when the department was 'imperialized.'

"In June, 1878, the government of India sanctioned arrangements for the publication of a daily weather report, which included observations made at 10 a. m. at about 100 stations. The hour was later changed to 8 a. m. It is to be noted that certain persistent discrepancies appear when the observations, after reduction to sea level, are compared, the most noteworthy cases being those of stations which are more or less completely shut in by hills of considerable elevation. The result of this condition is to check somewhat the horizontal movement of the air and to give too high a pressure during the morning. At the three stations where this topographic effect is most marked the excess of pressure averages about 0.02 in. at 8 a. m."

Studies on the meteorological effects in the United States of the solar and terrestrial physical processes, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bureau Doc. 290, pp. 37, figs. 13, charts 24*).—This includes the following papers reprinted from Monthly Weather Review for December, 1902, and January and February, 1903: The semidiurnal periods in the earth's atmosphere, synchronous changes in the solar and terrestrial atmosphere, the structure of cyclones and anticyclones on the 3,500-foot and 10,000-foot planes for the United States, and the mechanism of counter currents of different temperatures in cyclones and anticyclones.

Hurricanes: Especially those of Porto Rico and St. Kitts, W. H. ALEXANDER (*U. S. Dept. Agr., Weather Bureau Bul. 32, pp. 79, figs. 7*).

Weather changes and the appearance of scum on ponds, H. R. MILL, W. RAMSDEN, and F. J. HILLIG (*Nature [London], 69 (1903), Nos. 1775, p. 7; 1779, p. 104; 1780, p. 127*).—These articles note the occurrence of scum on ponds preceding any decided change of weather and offer various explanations of this phenomenon, the most plausible being that the formation of the scum is due to the rise of marsh gas from the ooze at the bottom of the ponds following a sudden fall in barometric pressure, the gas carrying along with it some of the solid matter of the ooze and thus forming the scum.

Influence of cultural operations on the production of white frost, A. PETIT (*Jour. Soc. Nat. Hort. France, 4. ser., 4 (1903), May, pp. 300–305*).—Observations on the effect of watering (irrigation), pulverizing and compacting the soil, and the application of compost and manure on the temperature of the soil are reported.

It was observed that saturating the soil with water retarded the radiation of heat, saturated soil being 2.6° C. warmer at a depth of 1 cm. and 1.1° to 2.2° warmer at the surface than dry soil the morning after the water was applied. Soil which had been pulverized was about 2° warmer than that which was left in a cloddy condition, and soil which had been first pulverized and then compacted was 4.2° warmer than cloddy soil. Soils with which compost had been incorporated showed at first a higher temperature in the surface soil, but practically the same temperature at a depth of 15 cm. as soil not so treated. The surface temperature, however, was apparently maintained at the expense of that of the lower layers of the soil, and in time the manured soil became colder than the unmanured. It is suggested that if large amounts of fresh and fermenting manure had been used instead of compost the results might have been different.

The influence of coverings of various kinds, including a layer of sand 10 to 12 cm. deep, as proposed by Rimpau, mulches, and living plants is discussed; and observations are reported which show that mulched soil has a lower temperature than unmulched, thus indicating that mulching increases the danger of frost.

Measurement of precipitation, C. F. Marvin (*U. S. Dept. Agr., Weather Bureau Circ. E, Instrument Division, pp. 27, figs. 10*).—The second edition of this pamphlet of instruction for the measurement and registration of precipitation by means of the standard instruments of the U. S. Weather Bureau.

The new cosmical meteorology, F. H. Bigelow (*Science, n. ser., 19 (1904), No. 470, pp. 30–34, figs. 3*).—In this article the attempt is made to present in orderly form the sequence between sun spots and meteorological conditions on the earth.

Weather folklore and local weather signs, E. B. Garriott (*U. S. Dept. Agr., Weather Bureau Bul. 33, pp. 153, charts 21*).—In this bulletin proverbs and sayings relating to wind, clouds, atmospheric pressure, temperature, and moisture, the habits and actions of animals and birds, and to plant life applicable to the United States are briefly quoted and discussed. Finally, a summary illustrated by charts is given of local weather signs as observed at regular stations of the Weather Bureau.

Proceedings of the second convention of Weather Bureau officials held at Milwaukee, Wis., August 27-29, 1901, edited by J. Berry and W. F. R. Phillips (*U. S. Dept. Agr., Weather Bureau Bul. 31, pp. 246, pls. 37, figs. 9*).

WATER—SOILS.

Irrigation experiments in 1901, J. A. Widtsoe et al. (*Utah Sta. Bul. 80, pp. 65–199, pls. 9, figs. 5*).—The experiments here reported represent the cooperative work of three departments of the station, and "deal wholly with the proper use of water by the farmer."

The experiments were made on 90 plats 2 by 4 rods and 8 plats 2 by 5 rods in size on the deepest and best land of the college farm, which is situated on typical "bench" land formed by former Lake Bonneville. The soil is underlaid at a variable but usually shallow depth by coarse limestone gravel, which secures perfect drainage, but increases the difficulty of thorough irrigation. Physical and chemical analyses of the first, second, and third feet of the soil are reported, and the specific gravity and water-holding capacity were determined. Data relating to temperature, sunshine, humidity, rainfall, and evaporation during the irrigating season are also given, as well as the temperature and composition of the irrigation water used.

The water was very constant in composition during the irrigating season. "Nitrogen was absent; phosphoric acid and potash were present only in small quantities. The fertilizing value of the water was therefore very small." The temperature varied from 54° F. in June and September to 60° in July and 62° in August. "All the water used on the plats was measured by means of a very carefully constructed Cippoletti weir" and a self-recording water meter. "The water was distributed entirely in small wooden flumes. One main flume passes across the whole system of plats, and lateral branches supply the different belts on either side of the main line." The construction of these flumes and their use in distributing the water are described in detail.

In the experiments reported an attempt was made to follow in considerable detail the downward and lateral movement of the water applied to the soil, by means of moisture determinations in samples of soil from different locations and depths and at different times; and to study the influence of irrigation on the growth, yield, and composition of crops, including, corn, oats, wheat, potatoes, sugar beets, alfalfa, red clover, timothy, and English rye grass. The results, which it is pointed out apply primarily to shallow bench lands, are summarized as follows:

"At the time of the first irrigation wheat and oats had drained the soil more completely of its moisture than had corn, potatoes, or sugar beets. Perennials use less water in early spring than do annuals.

"The amount of water held by the soil decreases with the depth.

"Only about 60 per cent to 75 per cent of the maximum water capacity of the soil is utilized one day after irrigation.

"The lateral movement of water in the soil of the college farm is about $4\frac{1}{2}$ ft. for the first foot; 6 ft. for the second foot. On soils like those of the college farm the lateral movement of the soil water is of little consequence to the farmer.

"The loss of the soil moisture is greatest from soil which has received most water, and is in direct proportion to the percentage of moisture in the soil immediately after irrigation. Of 2 soils having the same percentage of moisture, the deeper soil loses most moisture. The longer the time that elapses after an irrigation the more water is lost. About one-half of the water added in an irrigation is evaporated during the first week. All tillage, having in view the conservation of soil moisture, should [therefore] be put into operation as soon as possible after irrigation.

"The effect on the soil moisture in changing the relative humidity a few degrees is very slight. Sunshine is a strong factor in causing a loss of soil moisture. Of the 3 factors, relative humidity, sunshine, and temperature, the last is most potent in causing a loss of soil moisture. Winds cause a large loss of soil moisture.

"The rate of loss of soil moisture depends upon the kind of crop. The order, beginning with the most wasteful, is the following: Potatoes, oats, wheat, corn, sugar beets, old lucern, red clover, timothy, and English rye grass.

"The soil moisture is taken nearly at the same rate from the different depths, though the upper soil layer dries out first. The extent to which soils can dry out was 2.13 per cent for the first 3 in., 3.72 per cent for the first foot, and 4.63 per cent for the second. More water is lost from the furrow than from the row, though the soil under the row is quite moist.

"The percentage of water in plants and in the ripe seeds increases slightly with increase in irrigation. Heavy irrigations increase the percentage weight of the heads of plants; light irrigations increase the relative weight of leaves. Irrigation modifies definitely the composition of plants and plant parts; the seeds are affected more than any other plant part. The percentage of protein in corn kernels was increased from 12.05 to 15.08 as the amount of irrigation decreased, in oat kernels from 14.07 to 20.79, in wheat kernels from 15.26 to 26.72. In all these seeds the fat and nitrogen-free extracts were increased by liberal waterings. Increased irrigation increased the starch content and decreased the protein content of potatoes. The composition of sugar beets seemed to be less strongly affected by irrigation than were other crops. Between 20 and 25 in. of water yielded beets with the highest sugar content. The water in plants is somewhat dependent on the water in the soil.

"With a given amount of water, better yields of corn were obtained by flooding than by furrowing. Late irrigation did not affect unfavorably the growth and yield of corn. The proportion of ear corn to stover increased regularly with the increased application of water. The best amount of water for corn lies between 20 and 25 in.

"Late irrigations were found very beneficial in transferring nutritive materials from oat stalks to the heads. Not less than 15 in. of water should be used for oats, and not more than 30.

"Late irrigation was beneficial for the wheat crop. The percentage of grain in the wheat crop increased with increased irrigations. The yield of wheat increased up to 30 in. of water.

"Frequent small irrigations of potatoes produced the best yields. The percentage of marketable potatoes increased with irrigation.

"The best amount of water for sugar beets is about 20 in.

"Crops in an arid district require a greater number of pounds of water for 1 lb. of dry matter than in humid climates.

"Water has a varying value. The first few inches possess a much higher value than the later ones; and the value continues to decrease as the amount of water increases. By following the indications of the varying value of water it is possible that the irrigated area may be increased one-third or more with the amount of water now used."

The influence of soil moisture upon the chemical composition of certain plant parts, J. A. Widtsoe (*Jour. Amer. Chem. Soc., 25 (1903), No. 12, pp. 1234–1243*).—This is a brief discussion based on data reported in a recent bulletin of the Utah Station (see above) of results of a series of experiments with amounts of water varying from 5 to 40 in., applied to corn, oats, wheat, potatoes, and sugar beets on a shallow bench soil underlaid with coarse gravel. Chemical and physical analyses of the soil and analyses of the grains and tubers produced are reported, and the relation of the composition of the latter to the amounts of water used in irrigating the crops is discussed.

It is shown that the chemical composition of plants and plant parts is strongly influenced by the amount of soil moisture, the protein and nitrogen-free extract being affected to a greater extent than the other constituents. Withholding water from the plant increased the percentage of protein and diminished the percentages of nitrogen-free extract and fat, and vice versa. The variations in composition of crop brought about by varying amounts of water applied is shown in the following table:

Difference between highest and lowest percentages due to varying soil moisture.

Substance.	Protein.	Fat.	Nitrogen-free extract.	Starch.
Corn kernels	2.56	0.90	2.33	....
Oat kernels	5.31	.68	1.69	....
Wheat kernels	11.46	1.78	12.43	....
Potatoes	4.24	....	5.70	6.93
Sugar beets	4.88	....	5.05	....

Irrigation waters and their effects, W. P. Headden (*Colorado Sta. Bul. 83, pp. 16*).—A brief popular bulletin presenting some of the conclusions drawn from investigations reported in detail in a previous bulletin of the station (E. S. R., 15, p. 454).

Water used for drinking and similar purposes (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 22, pp. 1040–1059*).—This is a series of brief abstracts of and references to 60 recent articles relating to this subject.

The judging of drinking water from the standpoint of the physiology and hygiene of domestic animals, T. Kasparek (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 11, pp. 753–764*).—A general discussion of this subject is given, with some observations on the behavior of various pathogenic germs under different culture conditions.

The present status of soil investigation, C. G. Hopkins (*Illinois Sta. Circ. 72, pp. 21, figs. 6*).—This is the address of the chairman of the section on agriculture and chemistry of the Association of American Agricultural Colleges and Experiment Stations, at Washington, D. C., November 17, 1903 (E. S. R., 15, p. 329), with an introductory statement by E. Davenport and an added note by the author on methods. The paper calls attention to the discrepancies in the conclusions drawn by prominent investigators from studies in soil fertility, dealing more particularly with the methods and conclusions presented in Bulletin 22 of the Bureau of Soils of this Department. Basing his statements mainly upon his own work on soil fertility, the author dissents from many of the conclusions stated in this bulletin.

Field operations of the Bureau of Soils, 1902 (fourth report), M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1902, pp. 842, pls. 60, figs. 25, maps 44*).—This report contains a general review of the work of the Bureau of Soils during 1902 by the Chief of the Bureau, together with the following accounts of surveys: Soil Survey of the Bigflats Area, New York, by L. Mesmer and W. E. Hearn; Soil Survey of the Lyons Area, New York, by W. E. Hearn; Soil Survey of the Trenton Area, New Jersey, by R. T. A. Burke and H. J. Wilder; Soil Survey of the Albemarle Area, Virginia, by C. N. Mooney and F. E. Bonsteel; Soil Survey of the Hickory Area, North Carolina, by T. A. Caine; Soil Survey of the Mount Mitchell Area, North Carolina, by T. A. Caine and A. W. Mangum; Soil Survey of the Abbeville Area, South Carolina, by F. W. Taylor and T. D. Rice; Soil Survey of the Darlington Area, South Carolina, by T. D. Rice and F. W. Taylor; Soil Survey of Perry County, Alabama, by R. T. A. Burke et al.; Soil Survey of the Smedes Area, Mississippi, by W. G. Smith and W. T. Carter, jr.; Soil Survey of the Brazoria Area, Texas, by F. Bennett, jr., and G. B. Jones; Soil Survey of the Vernon Area, Texas, by J. E. Lapham et al.; Soil Survey of the Toledo Area, Ohio, by W. G. Smith; Soil Survey of the Columbus Area, Ohio, by W. G. Smith; Soil Survey of Union County, Kentucky, by H. W. Marean; Soil Survey of Posey County, Indiana, by H. W. Marean; Soil Survey of Tazewell County, Illinois, by J. A. Bonsteel et al.; Soil Survey of Clinton County, Illinois, by J. A. Bonsteel et al.; Soil Survey of St. Clair County, Illinois, by G. N. Coffey et al.; Soil Survey of Clay County, Illinois, by G. N. Coffey et al.; Soil Survey of the Janesville Area, Wisconsin, by J. A. Bonsteel; Soil Survey of the Dubuque Area, Iowa, by E. O. Fippin; Soil Survey of Howell County, Missouri, by E. O. Fippin and J. L. Burgess; Soil Survey of the Stuttgart Area, Arkansas, by J. E. Lapham; Soil Survey of the Wichita Area, Kansas, by J. E. Lapham and B. A. Olshausen; Soil Survey of the Grand Forks Area, North Dakota, by C. A. Jensen and N. P. Neill; Soil Survey of the Billings Area, Montana, by C. A. Jensen and N. P. Neill; Soil Survey of the Lewiston Area, Idaho, by L. Mesmer; Soil Survey of the Walla Walla Area, Washington, by J. G. Holmes; Soil Survey of the Lower Arkansas Valley, Colorado, by M. H. Lapham et al.; Soil Survey of the Yuma Area, Arizona, by J. G. Holmes; Soil Survey from Arecibo to Ponce, Porto Rico, by C. W. Dorsey, L. Mesmer, and T. A. Caine.

During the field season of 1902, 17,996 square miles or 11,517,440 acres were surveyed and mapped on a scale of 1 in. to the mile. Prior to that year the total area surveyed and mapped was 15,871 square miles or 10,157,440 acres. The average cost of the work in 1902 was $1.93 per square mile. The accounts of the individual surveys include, as heretofore, data relating to the location, history, topography, physiography, geology, climate, agricultural conditions, type soils, and crop adaptations.

Soil survey from Arecibo to Ponce, Porto Rico, C. W. DORSEY, L. MESMER, and T. A. CAINE (*Porto Rico Sta. Bul. 3, pp. 53, pls. 4, fig. 1, map 1*).—This bulletin, of which there are both English and Spanish editions, is a reprint from Report of Field Operations of the Bureau of Soils of this Department for 1902 (see above). The area reported upon extends 5 miles each side of the proposed government road from Arecibo to Ponce, and embraces many types of soil which are represented in other parts of the island. The report deals with location and boundaries of the area, history of settlement and agricultural development, climate, physiography and geology, water supply for irrigation, underground water and drainage, alkali in soils, and agricultural methods and conditions, and maps, and gives results of detailed surveys, including notes on crop adaptations of 18 type soils found in the area.

Washington soils, E. FULMER (*Washington Sta. Bul. 55, pp. 32*).—Chemical analyses of 25 soils from eastern Washington and 54 from western Washington, made by the same methods and with the same object in view as in previous investigations (E. S. R., 7, p. 375), are reported. The results confirm the conclusions drawn from the earlier analyses.

"The soils of the western, central, and eastern portions of the State show marked differences in their percentages of potash and lime. The potash content is generally greatest in the eastern part, and least in the western, while in the central portion the amount is intermediate. The lime content is greatest in the central part, where the minimum amount of rain falls. It is least in the western part, especially in those portions where the rainfall is 40 in. or more. An intermediate amount is found in that portion where the rainfall varies from 18 to 30 in.

"In many of the samples here reported, the amount of soda exceeds that of potash. This is unusual (except in alkali soils) and is doubtless due to the basaltic origin of the soil, and to the climatic conditions attending the soil-forming period."

The fertilizers likely to give best results on the different soils are indicated.

Ground temperature observations at Manila, 1896–1902, J. ALGUÉ (*Manila, 1902, pp. 16, pls. 3*).—A record is here given of a long series of observations on soil temperatures at depths varying from 9.84 to 59.06 in. From the data which are given in tables and diagrams the following conclusions are drawn:

In the cool season the soil temperature at a depth of half a meter is lower than the air temperature, and at 1 meter oscillates around the maximum temperature of the air. On warm days the temperature below 19.68 in. ranges higher than the air temperature, but at 1 meter also oscillates around the highest temperature at the surface. The temperature at 39.38 in. remains stationary from sunset to sunrise, and 19.68 in. from midnight to sunrise. The maximum temperature was observed at 10 a. m., both at 39.38 and at 19.68 in., from 6 a. m. at both depths. "Changes become more accentuated at 19.68 in., the rise of temperature being very remarkable after 6 a. m. This may clearly explain why at 8 a. m. underground temperature at 19.68 in. is constantly higher than the air temperature, even during the cool season. Underground temperature is lower during the warmest hours above the ground." The relation of soil temperatures to sickness and disease is discussed.

The alkalinity of soils and its effect on the growth of cereals, V. PEGLION (*Staz. Sper. Agr. Ital., 36 (1903), No. 8–9, pp. 684–694*).—The results of observations on this subject by the author and others are summarized.

Are soluble iodids absorbed by the soil? S. SUZUKI (*Bul. Col. Agr. Tokyo Imp. Univ., 5 (1903), No. 4, pp. 519–521*).—Tests are reported which show that an iodid is more quickly and completely absorbed by the soil than a chlorid.

Guide to the scientific study of soils, F. WAHNSCHAFFE (*Anleitung zur wissenschaftlichen Bodenuntersuchung. Berlin: Paul Parey, 1903, pp. 190, figs. 54*).—The second revised edition of this well-known work.

FERTILIZERS.

The fertilizer value of various nitrogenous fertilizers, with especial reference to green manure and barnyard manure, A. VON 'SIGMOND (*Landw. Vers. Stat., 59 (1903), No. 3–4, pp. 179–215*).—Three series of pot experiments carried out during 1900 and 1901 are reported. The pots used were of glazed clay 30 cm. deep and having a surface area of 410 sq. cm. The soil used was a calcareous sand poor in nitrogen. The fertilizers used were nitrate of soda, sulphate of ammonia, horn meal, dried blood, dried pig manure, fresh and well-rotted barnyard manure, and green manures of various kinds. These were applied in amounts furnishing about 135 kg. of nitrogen per hectare (120.49 lbs. per acre). The crops grown in the different experiments included barley, *Viehkraut*, white mustard, summer rape, and buckwheat. The influence of the fertilizers was studied on 2 successive crops, the fertilizers being applied only to the first.

Detailed data are given for the yields and nitrogen content of the crops, and from

these data the utilization of the nitrogen of the various fertilizers during the first and second year is calculated. The results are summarized in the following table:

Utilization of nitrogen in various fertilizers.

Kind of nitrogenous fertilizer.	In the first year.			In both years.	
	First series.	Second series.	Third series.	First series.	Second series.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Nitrate of soda	71	45.0	77	71	53
Sulphate of ammonia	62	41.0	60	67	46
Horn meal	68	38.0	61	67	46
Dried blood	56	22.0	40	59	27
Liquid manure	53	19.0	24	54	26
Dry pig manure	44	19.0	31	52	27
Green vetches turned under in the fall	44	35.0	50	50	45
Alfalfa hay turned under in the fall	39	25.0	30	41	32
Alfalfa hay turned under in the spring	....	29.0	50	....	33
Well-rotted barnyard manure applied in the fall	26	14.0	19	41	22
Fresh barnyard manure applied in the spring	31	4.5	20	35	18
Fresh barnyard manure applied in the fall	29	16.0	16	34	28
Well-rotted barnyard manure applied in the spring	16	1.0	10	30	7

The relative effectiveness of the different fertilizers as compared with nitrate of soda is shown in the following table:

Relative effectiveness of different nitrogenous fertilizers, taking nitrate of soda as 100.

Kind of nitrogenous fertilizer.	First series of experiments.	Second series of experiments.	Average.		
	Per cent.	*Per cent.*	*Per cent.*		
Sulphate of ammonia	94	87	90		
Horn meal	94	87	90		
Dried blood	83	51	67		
Liquid manure	76	49	62		
Dry pig manure	73	51	57		
Green vetches turned under in the fall	70	85	78	69	
Alfalfa hay turned under in the fall	58	60	59		
Alfalfa hay turned under in the spring	....	62	62		
Well-rotted barnyard manure applied in the fall	58	41	49		45
Fresh barnyard manure applied in the spring	49	34	41		
Fresh barnyard manure applied in the fall	48	53	50		
Well-rotted barnyard manure applied in the spring	42	(13)	42(27)		

The methods of exact field manurial trials (*Jour. Bd. Agr.* [*London*], *10* (*1903*), *No. 2, pp. 220–225*).—This is a summary of Wagner's views regarding the principles which should be borne in mind in conducting field experiments with fertilizers. The main factors upon which emphasis is laid are uniformity of soil; the use of numerous control plats; the employment of accurately laid out, square, fortieth-acre plats; the careful preparation, measurement, weighing, and application of fertilizers; and the weighing and sampling of the crop on the plats as soon as harvested.

The fermentation of boengkil, H. A. C. VAN DER JAGT (*Meded. Proefstat. Suikerriet West Java, 1903, No. 66, pp. 25; reprint from Arch. Java Suikerind, 1903, No. 17*).—Boengkil is a fertilizer made from peanut-oil cake. This material, when piled in large heaps, ferments and the heat has been known to cause spontaneous combustion. Since the rise in temperature may be prevented by the addition of chloroform or carbolic acid, the author concludes that it is due to micro-organisms. The addition of water to the boengkil was found to be necessary to start fermentation. It is explained that the water brings some of the material into solution and thus enables the organisms not only to multiply rapidly, but also to make use of those portions of the food material not already in solution.

It is further shown that the fermentation is due to aerobic organisms, since exclusion of air prevents a rise in temperature.

Attempts to cause spontaneous combustion failed, the author being unable to secure a temperature above 55° C. He thinks that for spontaneous combustion to occur the boengkil must be in large masses.

A study of the losses due to fermentation gave the following results for each of the principal constituents:

Losses due to fermentation of boengkil.

	Nitrogen.	Fat.	Pentosans.	Dry matter.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Sample 1	9.55	80.30	16.56	22.14
Sample 2	18.11	79.12	31.48	31.53
Sample 3	23.34	70.97	44.50	35.26
Sample 4	24.62	50.40	36.86	38.69

—H. M. PIETERS.

The management and use of barnyard manure, A. STUTZER (*Die Behandlung und Anwendung des Stalldüngers. Berlin: Paul Parey, 1903, 2. ed., enl., pp. VIII+168, figs. 19*).—This is a second enlarged edition of the author's treatise on the work of bacteria in barnyard manure, and discusses in detail the action of bacteria in manure and in soils, the production and management of barnyard manure, and the action of the manure when applied to the soil in various ways and for various crops. A list of 102 references to literature on the subject is given.

On green manuring light land, T. S. DYMOND and B. W. BULL (*Essex County Council, Education Com., Tech. Labs., 1903, Oct., pp. 28, 29*).—A brief account is given of a comparison on wheat and oats of plowing under mustard and pasturing it off by sheep. The results are slightly in favor of pasturing off the crop.

Manures in the Natal market, season 1903, A. PARDY (*Natal Dept. Agr. Bul. 4, pp. 12*).—Analyses are reported with general discussion.

The menhaden industry (*Amer. Fert., 19 (1903), No. 6, pp. 7–14*).—The nature and habits of the menhaden and the methods of catching the fish are described. The uses made of the fish and the methods of treatment for preparation of oil and fertilizer are explained. Analyses of samples of fish scrap are reported, and the fertilizing value of the material is discussed. The names of a number of firms which prepare fish fertilizers are given.

Atmospheric nitrogen for fertilizing purposes, F. H. MASON (*U. S. Consular Rpts., 74 (1904), No. 280, pp. 36, 37*).—A brief note referring to the preparation of calcium cyanamid and its value as a fertilizer (E. S. R., 15, pp. 25, 347, 423).

Fertilizers and amendments for soils deficient in lime, T. BIÉLER (*Chron. Agr. Canton Vaud, 17 (1904), No. 1, pp. 1–14*).—Simple methods of determining the lime content of soils are described, and means of supplying deficiencies of this constituent are briefly discussed.

The mineral industry: Its statistics, technology, and trade for 1902 (*New York and London: Engineer. and Min. Jour., 1903, vol. 11, pp. XXX+891, figs. 123*).—This, the eleventh annual volume of this series of reports, gives the usual summary of statistics, with special articles by different authors relating to the mineral industry in the United States and other countries, prepared under the editorship of J. Struthers. Among the subjects treated which are of special agricultural importance are ammonia and ammonium sulphate, cement, clay, gypsum, phosphate rock, potassium salts, common salt and other sodium salts, and stone.

"The production of ammonia (reported as its equivalent sulphate salt) and ammonium sulphate by by-product coke-oven plants in the United States during 1902 is estimated at 65,000 metric tons, and for 1901 at 60,000 metric tons, which

shows the active development of this industry, due chiefly to the increase in the number of by-product coke ovens now in operation." The world's production of ammonium sulphate during 1902 is stated to be 548,500 metric tons, and the imports into the United States 16,119 tons.

The production of cement in the United States during 1902 was as follows: "Portland cement, 16,535,000 bbls. (of 400 lbs.), valued at $16,637,500, as compared with 12,711,225 bbls., valued at $12,532,360, in 1901; natural hydraulic cement, 9,083,759 bbls. (of 300 lbs.), valued at $4,087,692, as compared with 7,084,823 bbls., valued at $3,056,278, in 1901, and slag cement, 547,175 bbls. (of 400 lbs.), valued at $465,099, as compared with 272,689 bbls., valued at $198,151, in 1901. . . .

' The production of clay products in the United States during 1901 increased considerably over the output of the preceding year, the aggregate value being $87,747,727, as compared with $78,704,678 in 1900. . . .

"The production of gypsum in the United States continued to increase greatly during 1902, although statistics of production during this year are not now available. The production during 1901 was 659,659 short tons, valued at $1,577,493. . . .

"The production of all varieties of phosphate rock in the United States during 1902 amounted to 1,464,668 long tons, valued at $4,636,516, as compared with 1,483,723 long tons, valued at $5,316,403, which shows a decrease of 38,955 long tons in quantity and $679,887 in value from the statistics of the earlier year."

Of the output for 1902, South Carolina supplied 313,365 tons, Florida 759,784, North Carolina 25,000, Tennessee 390,799, other States 720 tons.

"The imports of potassium salts into the United States in 1902 were as follows: Potassium chlorid, 140,980,460 lbs. ($2,141,553); crude potassium nitrate, 10,505,474 lbs. ($299,416); potassium chlorate, $1,209,148 lbs. ($60,429); all other potassium salts, 92,857,009 lbs. ($1,820,585); a total of 245,552,091 lbs., valued at $4,321,983, as compared with a total of 231,146,770 lbs., valued at $4,268,067 in 1901. The exports of domestic potash and pearl ash in 1902 were 1,408,342 lbs., valued at $66,027, as compared with 1,077,605 lbs., valued at $52,802 in 1901. The exports of foreign potassium salts in 1902, consisting of potassium chlorid, chlorate, nitrate, and other salts, aggregated 1,266,125 lbs., valued at $59,789, as compared with 633,100 lbs., valued at $43,446 in 1901."

The world's supply of potash still comes in the main from the great natural deposits of Germany, but explorations in Death Valley and elsewhere in the United States for natural deposits of potash salts are being made with some promise of success.

"The total production of salt in the United States during 1902, including that used for the manufacture of alkali and heavy chemicals, amounted to 23,849,221 bbls., valued at $5,668,636, as compared with 20,566,661 bbls., valued at $6,617,449 in 1901." The leading salt-producing States in the order of percentage of output during 1902 were as follows: Michigan 34.1 per cent, New York 35.8 per cent, Kansas 9.1 per cent, and Ohio 8.9 per cent.

"The production of soda and sodium salts [including soda ash, bicarbonate, and crystals] in the United States for the year 1902 is estimated at 562,000 metric tons, as compared with 480,000 metric tons for the year 1901."

While extensive beds of nitrate of soda are being exploited in northern San Bernardino County, Cal., most of this salt used in the United States is imported from abroad and comes from Chile. The import of nitrate into the United States in 1902 was 330,674.4 short tons, valued at $5,996,205, as compared with 233,692.5 tons, valued at $5,997,595 the previous year (see also E. S. R., 15, p. 131).

The value of the stone produced in the United States during 1901 was $55,488,137,

against $45,066,708 in 1900, not including slate and the sandstone used in the manufacture of grindstones and whetstones.

The potash deposit in the Werra district, C. BAUER (*Chem. Ztg., 27* (*1903*), *No. 88, pp. 1085, 1086*).—The deposit is briefly described and the composition of the various salts found in it is given.

The conversion of hartsalzs and mixed crude potash salts into potassium chlorid, C. BAUER (*Chem. Ztg., 27* (*1903*), *No. 104, pp. 1268–1270*).

Commercial fertilizers, E. H. JENKINS ET AL. (*Connecticut State Sta. Rpt. 1903, pt. 1, pp. 112*).—This includes a statement of the duties of manufacturers and dealers and of the experiment station in connection with the inspection under the State fertilizer law; a list of firms licensed to deal in fertilizers in the State during 1903; notes on the methods followed in sampling and collecting fertilizers; explanations regarding the analysis and valuation of fertilizer; a review of the fertilizer market for the year ended October 31, 1903; and tabulated analyses and valuations of 489 samples of fertilizing materials, including nitrate of potash, nitrate of soda, sulphate of ammonia, dried blood, cotton-seed meal, castor pomace, dissolved rock phosphate, carbonate of potash, sulphate of potash, double sulphate of potash and magnesia, muriate of potash, kainit, bone manures, slaughterhouse tankage, dry ground fish, bone and potash, nitrogenous superphosphates and guanos, tobacco stems, vegetable ashes, ashes of tobacco stalks, cotton-hull ashes, wood ashes, limekiln ashes, oyster-shell lime, sheep manure, garbage tankage, cocoanut pith, and mixed fertilizers.

Analyses of commercial fertilizers, M. A. SCOVELL and H. E. CURTIS (*Kentucky Sta. Bul. 109, pp. 117–191*).—"There were 331 different brands of commercial fertilizers registered from January 1 to August 22, 1903. Of these different brands 192 were complete fertilizers, or fertilizers containing all three of the essential ingredients, namely, phosphoric acid, nitrogen, and potash; 33 were acid phosphates, or superphosphates; 10 contained a mixture of acid phosphates and nitrogen compounds only; 44, acid phosphate and potash salts only; and 52 were classed as bones or tankage.

"Two hundred and sixty-seven samples were collected by deputy inspectors, or were sent by farmers from various parts of the State. Three hundred and thirty-one samples were those sent in by firms as official samples. Of these samples 519 were analyzed by the station.

"The results of the analyses show that of the 519 samples analyzed, 89, representing 79 brands and 29 firms, fell so far below the guaranteed analyses in phosphoric acid, nitrogen, or potash, or any two, or all three of these ingredients, that the deficiencies could not be accounted for by variations in sampling or analysis. It is probable that in most cases variations can be accounted for by hurried or careless mixing at the factories, or gross mistakes in shipping one brand for another, but in one or two instances the results show a desire on the part of the manufacturer to guarantee a higher percentage of the essential ingredients than the goods contain."

Analyses of commercial fertilizers and manurial substances, C. A. GOESSMANN (*Massachusetts Sta. Bul. 92, pp. 36*).—A report of analyses of 324 samples of fertilizing materials, including wood ashes, lime ashes, cotton waste, bone dust, wool waste, mill refuse, dried blood, peat, cotton-seed meal, manure, Peruvian guano, Belgian phosphates, soils, and mixed fertilizers. A scale of prices for 1903 is given.

Commercial fertilizers, H. J. WHEELER ET AL. (*Rhode Island Sta. Buls. 93, pp. 131–147; 97, pp. 47–60*).—These bulletins report analyses and valuations of 117 samples of fertilizing materials inspected during 1903. The fertilizers sold in the State during the year were found "to correspond more nearly with the guaranties than in any one of the past 5 years."

FIELD CROPS.

Cooperative field experiments, 1902 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1903), No. 3, pp. 490–522*).—In a fertilizer test with potatoes, the best yield was obtained on a plat fertilized at the rate of 15 tons of barnyard manure, 1 cwt. of sulphate of ammonia, 4 cwt. of superphosphate, and 1 cwt. of muriate of potash per acre. The results in general indicate that the use of commercial fertilizers with a moderate application of barnyard manure is profitable. The plat receiving 20 tons of barnyard manure per acre yielded 8.9 tons, and the plat receiving only 15 tons produced 8 tons per acre. In a test of varieties Beauty of Bute, Charles Fidler, Up-to-Date, and Dr. Matthew produced the best yields. In another series of cooperative tests Black Skerries and Champion II proved much superior in yield and quality to Reliance.

The results with turnips also indicate that barnyard manure and commercial fertilizers may be profitably used in combination. Ten tons barnyard manure with 4 cwt. of superphosphate gave fully as good returns as 20 tons applied alone. Among 9 varieties of swedes Triumph, Best of All, and Magnum Bonum gave the best yields, and of 5 varieties of yellow turnips Centenary produced the heaviest yield.

In growing fodder beets it was found that an addition of 4 cwt. of superphosphate, 2 cwt. of sulphate of ammonia, and 2 cwt. of kainit to 15 tons of barnyard manure per acre, representing an outlay of 43 shillings for commercial fertilizers, resulted in a profit of 26 shillings. A substitution of 4 cwt. of salt for the kainit in this application gave somewhat contradictory results, but the average yields are in favor of the salt.

It was found that complete applications of commercial fertilizers in growing oats are more likely to give uniformly good results than incomplete applications. Kainit when used alone resulted in a loss. Sulphate of ammonia was the only fertilizer which gave a profit when applied alone. Among the varieties tested in 1900 Waverly, Goldfinder, and Canadian Banner led in productiveness. In a second series of cooperative tests Tartar King gave better satisfaction than Waverly, Goldfinder, and Pioneer. The different varieties of oats are described. A discussion on the use of fertilizers in connection with the different crops based on the results of experiments is presented.

The Essex field experiments, 1896–1903: No. 2.—On tillage crops, T. S. Dymond and B. W. Bull (*Chelmsford, Eng.: Essex Education Committee, 1903, pp. 48, fig. 1, map 1*).—This is a compilation of results of experiments carried out by 15 farmers of Essex. Tabular statements of the data obtained with the various field crops are given, together with brief discussions and summaries of the results.

Winter beans, spring beans, and clover required, in connection with 12 tons of barnyard manure per acre, an application of 3 cwt. of superphosphate. Without barnyard manure 4 cwt. of superphosphate per acre, or the same quantity of basic slag, on soil deficient in lime gave good results. These applications were also most remunerative at the commencement of rotations beginning with beans or clover. One cwt. of sulphate of ammonia in addition to the superphosphate was found advantageous only when the crops were grown for fodder. It has been found that kainit applied with barnyard manure decreases the yield. With peas on clay soil, barnyard manure and sulphate of ammonia had very little effect. Nitrogenous manures are not recommended for leguminous crops when these are to be followed by cereals in rotation. In a rotation of peas, wheat, barley, and clover, barnyard manure for peas, sulphate of ammonia or nitrate of soda for wheat, and superphosphate or basic slag for barley or clover are suggested.

Of 6 varieties of oats, Garton White Abundance led in yield of grain and straw, as well as in weight of grain per bushel. This new variety is considered as having distinct advantages over the older sorts and as being the most profitable for the

region. Nitrate of soda in ordinary seasons is regarded as being the more effective in increasing the yield of grain and straw, but as showing a lesser influence with regard to quality of grain.

On light gravelly land a complete application of commercial fertilizers for cereals was unprofitable, and pasturing a crop of green mustard proved of greater advantage than plowing it under.

Cooperative fertilizer experiments with potash in Alsace-Lorraine, A. Wolf (*Deut. Landw. Presse, 31 (1904), No. 1, pp. 3, 4, figs. 8*).—In these experiments barley, potatoes, and fodder beets were grown on light and heavy soils, and clover on heavy soils only. Each test consisted of a check plat, 1 plat receiving superphosphate or Thomas slag and nitrate of soda, and another receiving, in addition to these, either 40 per cent potash salt or kainit. The clover received no nitrogen. In all the experiments the application of potash resulted in a profit. The most profitable results in the series were obtained from fodder beets on light soil, receiving an application of 450 kg. of superphosphate, 400 kg. of nitrate of soda, and 300 kg. of 40 per cent potash salt per hectare. Potash also gave very profitable results on both kinds of soil when used as a fertilizer for potatoes in combination with nitrate of soda and superphosphate.

Cooperative experiments in top-dressing grass land, H. J. Wheeler (*Rhode Island Sta. Bul. 95, pp. 19*).—Previous work of this character has been noted (E. S. R., 15, p. 32). In 1902 cooperative experiments were conducted on 11 farms, in various sections of the State. The application used as a top-dressing during the latter part of April consisted of 350 lbs. nitrate of soda, 300 lbs. muriate of potash, and 600 lbs. acid phosphate per acre.

Results obtained at the station indicate that a reduction of 50 to 100 lbs. in the quantity of muriate of potash and of 100 lbs. in the quantity of acid phosphate applied would have been more profitable. The experiments in general showed the necessity of carefully preparing the seed bed and of seeding heavily for the purpose of obtaining a good stand of grass. The greatest loss per acre in the tests was \$11.23 and the greatest net profit \$23.59; the next greatest loss and gain were \$5.18 and \$18.64 per acre, respectively. In some of the experiments, owing to the natural fertility of the soil and the kinds of grass grown, smaller applications would have been profitable where the full application resulted in a loss. The average result of all experiments, estimating the hay at \$16 per ton, shows a net profit of \$3.60 per acre and a return of 20.9 per cent on the investment in top-dressing. In addition to the report on the experiments, directions for grass culture in Rhode Island are given.

Composition of the oils contained in the seed of Robinia pseudacacia, Caragana arborescens, Trifolium repens, and T. pratense, V. Jones (*Abs. in Chem. Ztg., 27 (1903), No. 93, Repert. 21, p. 302*).—Brief notes are given on the composition of the oils in the seeds of the different plants. The oil in the seed of red clover belongs to the series which unites the drying and nondrying oils. The solid fatty acids in the oil of this seed contain palmitic and stearic acids and the liquid fatty acids, oleic and linoleic acids, the oleic being predominant. The oil in the seed of white clover was of the same composition, with the exception that it contained a higher percentage of oleic acid.

The content of dry matter, sugar, and nitrogen compounds in fodder beets at different stages of growth, J. A. Le Clerc (*Landw. Vers. Stat., 59 (1903), No. 1–2, pp. 27–81; abs. in Chem. Centbl., 1903, II, No. 23, p. 1291*).—This article has been noted from another source (E. S. R., 15, p. 351).

Culture experiments with red clover from different countries, Gisevius (*Arb. Deut. Landw. Gesell., 1903, No. 83, pp. 182*).—Under the direction of the German Agricultural Society cooperative culture tests by 9 different experimenters were made with red-clover seed from Germany, Russia, Austria, Italy, France, Canada, and the United States. The collection of seed represented 15 different sources, and

each experimenter was furnised with 30 commercial samples, which were sown in duplicate on plats 1 are in size.

The seed was sown in 1900, and the results obtained, together with the observations made in 1901 and 1902, are reported and discussed at some length. The seed samples are described in detail and the number of weed seeds found per kilogram of seed is shown in a table, which records in this connection seeds from 174 species. The prevalence of dodder and the ability of the different kinds to withstand the winter, and the differentiating characters of the various sorts, are noted.

The conclusion is drawn that German red-clover seed, especially the kind produced in Silesia and East and West Prussia, proved superior to seed from any other source. The seed from Russia and Austria ranked next in value, the seed from France gave comparatively small returns and the seed from Italy ranked lowest. The relative values of all samples ranged from 66 to 111, and in this class seed obtained from Pennsylvania stood fourth, with a value of 103, and seed from Missouri eleventh, with a value of 99.

Indian corn in Argentina: Production and export, F. W. Bicknell (*U. S. Dept. Agr. Rpt. 75, pp. 48, pls. 7*).—This report describes quite fully the climate of Argentina in its relation to corn culture, and discusses at some length the production and exportation of the crop. Statistics on the acreage, yield, and quantities exported are presented, together with records of meteorological data. In connection with a description of the methods employed in the cultivation of the crop the varieties commonly grown are briefly noted. The results of a test made by the Argentine government of newly introduced varieties are summarized in the following table:

Results with foreign varieties of corn in Argentina.

Variety.	Time of planting.	Seed planted.	Yield.	Time of ripening.
Yellow varieties:		*Pounds.*	*Pounds.*	
Queen	November 1	4.4	418	May.
Pedrick Golden	do	4.4	330	May.
Golden	End of October	4.4	264	March.
Precious of Auxonne	December 1	4.4	176	April.
Canadian Flint	End of October	2.2	88	March.
Chester Giant	November	2.2	66	May.
Lombardy	End of October	2.2	88	March.
King Philip (brown)	do	4.4	209	May.
White varieties:				
Hickory King	November	2.2	165	May.
Horse Tooth	End of October	6.6	176	May.
Neapolitan Grand	November	4.4	110	April.
White Head	End of October	4.4	44	

Six of these varieties were obtained from North America. Pedrick Golden and Golden are recommended as the best yellow varieties.

In considering the exportation of corn the author discusses shipping facilities and proposed improvements, grading, inspection, freight rates, and prices, and quotes the opinions of experts as to the conditions necessary for successful ocean shipment.

Cowpea experiments, C. L. Newman (*Arkansas Sta. Bul. 77, pp. 32*).—In 1902 over 350 plats of cowpeas, including 54 planted with sports, selections, and crosses, were grown. The results from 1898 to 1902, inclusive, show that the largest yield of peas was obtained in the years with the least rainfall. The highest average yield of hay was also recorded for the year having the smallest precipitation. In wet weather the plants are likely to suffer from mildew, and hence rainy seasons have a tendency to decrease the yield of peas and to a lesser extent the yield of hay. Directions for the culture of cowpeas and their use as a catch crop are given.

Drilling the seed has generally given better results than broadcasting. More favorable yields were also obtained from thin than from heavy seeding. In 1900 Whippoorwill peas sown at the rate of 1 and 8 pecks per acre gave 3,314 lbs. of hay

and 31.4 bu. of peas, and 1,748 lbs. of hay and 16.4 bu. of peas per acre, respectively. In 1901 peas sown at the rate of 12.5 lbs. per acre yielded 400 lbs. of hay and 16.51 bu. of peas more per acre than peas sown at the rate of 100 lbs. per acre.

A good preparation of the soil with subsequent cultivation of the crop gave very profitable returns. The increase in the yield of hay on cultivated plats at the station was in some instances over 50 per cent and in others over 100 per cent greater than the yield on uncultivated plats.

The results of fertilizer experiments conducted in 1901 and 1902 indicate that applications of nitrogen did not benefit cowpeas on the station soil. Plats receiving phosphoric acid or potash, in combination or alone, showed a substantial increase in the yield of peas and hay. Attention is called to the fertilizing value of cowpeas by the results of growing the crop in rotation with oats or wheat. In one instance a plat sown to cowpeas in the spring produced $18 worth of hay, and afterwards a crop of oats valued at $18.50, while a plat of oats not following cowpeas gave a return of only $11.58. In another instance cowpeas produced $19.33 worth of hay and the stubble plowed under increased the following crop of wheat by 61 per cent, as compared with wheat not following cowpeas. The values of the crops in this case were $32.53 and $8.08, respectively.

A series of experiments in progress for 4 years show an average yield of wheat of 10.95 bu. per acre on plats on which no fertilizers were used and no cowpeas were grown. During the 4 years the plats upon which a whole crop of cowpeas had been plowed under before the first crop of wheat was sown yielded a total of 15.55 bu., and the plants upon which only the stubble were turned under, a total of 10.45 bu. more per acre than the plats receiving no treatment whatever. The use of cowpeas as described gave better returns than 100 or 200 lbs. nitrate of soda or 200, 400, 600, or 800 lbs. of complete fertilizers per acre applied for the first crop of wheat.

Plats of corn planted with cowpeas, either in drills or broadcasted at the last cultivation, produced an average value of total product for 2 years of $50.99, where both peas and hay were harvested, as compared with an estimate of $54.31 for the plats on which peas were gathered and the remaining portion of the crop was grazed by cattle. The average value of the total product for the 2 years on the plats without cowpeas was $23.80. Warren Extra Early, a variety suited to late planting, was used in these tests.

A series of plats which had produced a crop of wheat preceded by cowpeas sown broadcast were again planted to cowpeas in drills in June, 1901. One plat was left bare as a check. The cowpeas were harvested in the fall and a second crop of wheat sown. The average value of the wheat and the cowpeas grown as a catch crop on 7 plats in 1901 was $26.85 per acre, while the crop of wheat on the check plat was worth only $11.84. The plats planted to cowpeas in 1901 produced in 1902 an average of 2.43 bu. more wheat than the check plat, an increase of 17.8 per cent.

A test of 123 samples of cowpeas, embracing about 35 varieties under about 45 names, was made in 1902 and the results are tabulated. Calico, Coffee, Extra Early Black Eye, Iron, New Era, Red Yellow Hull, Speckled Java, Warren Extra Early, Warren New Hybrid, Watson Hybrid, Whippoorwill, and White Brown Eye produced the highest yields of shelled peas. The heaviest yield of hay, 8,700 lbs. per acre, was secured from Clay. New Era, Old Mans, Warren Extra Early, Extra Early Black Eye, and Warren New Hybrid gave a greater proportion of peas to vines than the other varieties tested and are recommended for their early maturity.

Flax experiments, 1902 (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1903), No. 4, pp. 663–681*).—Results for 1901 have been previously noted (E. S. R., 14, p. 348). Three plats for the purpose of testing salt, rape meal, and basic slag were added to the series in 1902, and larger quantities of kainit and muriate of potash were used.

The results of all cooperative tests showed that the flax on all plats excepting those receiving potash was slightly yellowed, that superphosphate encouraged the growth

of weeds, especially charlock and spurry; and that the muriate of potash plat presented the best appearance, being followed by the plat receiving kainit. Muriate of potash apparently increased the percentage of scutched flax to retted straw and also slightly improved the quality of the flax. The kainit plats show a greater yield of retted straw, but no increase in scutched flax as compared with the check plat. Kainit was applied at a loss, which is considered due to the unfavorable season. The use of potash gave profitable returns in some instances. The plat receiving 4 cwt. of salt per acre produced a smaller yield of retted straw and a higher percentage, but a lower total yield of scutched flax than the unmanured plat. The use of salt did not affect the quality.

A mixture of kainit and superphosphate was more effective than either of these fertilizers applied alone. The results with a mixture of kainit, superphosphate, and sulphate of ammonia were in accordance with those of the previous year. The use of 5 cwt. of rape meal per acre seemed to have increased the yield of retted straw, decreased the yield and proportion of scutched flax, and to have injured the quality. The rape meal was applied at a loss. The average returns for basic slag applied at the rate of 5 cwt. per acre indicate a reduction in the yields of retted straw and scutched flax and also in the ratio of fiber to straw. The experiments are to be continued.

Belfast Brand and Riga Child from Dutch seed and Belfast Brand and Pernau Crown from Riga seed were grown for comparison. The Riga seed gave larger yields of scutched flax than the Dutch seed, and for the varieties the results were in favor of Pernau Crown. The seed of this variety also produced a flax of superior quality to that obtained from the seed of the other varieties. As in 1901, the Russian seed gave better financial returns than the Dutch seed. Contrary, however, to the results of the previous year, the Belfast Brand of Dutch seed yielded more scutched flax and gave better financial returns than the Dutch Riga Child seed.

A comparison of the Irish and the Belgian Courtrai system of scutching gave financial results in favor of the Belgian system. The results of these scutching tests for the last 2 years are summarized as follows: "With Irish retted straw Irish mills, in the hands of Irish workers, give better pecuniary returns than does a Courtrai mill in the hands of Courtrai scutchers. With Belgian retted straw . . . the Courtrai mill gives the better returns. With straw retted in Ireland by the usual method, the Courtrai mill worked by Belgians, and fitted with modified blades, yields more profitable returns than does the Irish mill worked by Irishmen, or the unmodified Courtrai mill worked by Belgians."

An experiment to determine the influence of rippling resulted in a reduced yield of retted straw and of scutched flax. The seed obtained did not cover the expense and loss incurred. A heavy rainfall greatly influenced this trial.

Experiments with oats and barley, R. S. Seton (*Bd. Agr. and Fisheries* [*London*], *Rpt. Agr. Education and Research, 1902–3, pp. 77–86*).—The comparative weights of 2,000 grains of 14 varieties of oats, the percentage of husk, and the weight per plat of unshelled and shelled grain are tabulated. Experiments were conducted for 3 consecutive years. The grains of the new varieties obtained by selection and hybridization were the heaviest and the largest. The season influenced the weight of the grain of some varieties considerably, while upon others it had hardly any effect.

Attention is called to the difference in the number of plants of different varieties to be expected on a certain area, when the same quantity of seed by weight is sown. It is shown that the percentage of husk is influenced by the variety and the season. Goldfinder, at the head of the list in productiveness, contained 4 oz. of husk in 1 lb. of grain, and Pioneer, ranking last, contained $5\frac{1}{2}$ oz. Black Tartarian and Pioneer, both black varieties, have a high proportion of husk. In 1900 and 1901 the average weight of husk on 200 grains of all varieties was 1.82 and 1.827 gm., respectively, and

in 1902, a wet season, 1.573 gm. It is stated that a wet season generally produces larger and more uniform kernels and thus reduces the percentage of husk.

Storm King and Tartar King were the heaviest yielders in 1902, and Abundance, New Market, Goldfinder, and Waverly are considered the most generally reliable. Brief comparative and descriptive notes on the different varieties are given.

Tartar King, a large-grained variety, yielded 3 bu. of grain and 2.5 cwt. of straw more per acre when sown at the rate of 5 bu. than when sown at the rate of 4 bu. Equal weights of black and white oats were sown as a mixture for 2 years and each season the proportion of white oats in the yield was largely increased.

Among 5 varieties of barley Invincible gave the most satisfactory yield in 1902 and ranked second in point of quality. The results for 1901 and 1902 indicate that about 3 bu. of seed per acre is sufficient for barley. Treating the seed against smut gave no large increase in grain but greatly improved the quality.

The influence of lime and marl on the yield of potatoes and on their content of nitrogen and mineral matter, Ulbricht (*Landw. Vers. Stat., 59 (1903), No. 1–2, pp. 1–25; abs. in Deut. Landw. Presse, 30 (1903), No. 85, p. 734; Chem. Centbl., 1903, II, No. 23, p. 1290*).—In these experiments the plants were grown in sheet-iron cylinders, sunk into the ground, for the purpose of better controlling soil and moisture conditions and to make these uniform for the 34 different tests. A movable protection covered the entire series of cylinders.

Lime did not show a definite influence on the prevalence of potato scab, but the use of marl slightly increased the number of scab spots. In practice the author has noticed that on marled soil potatoes following rye, which had received a heavy application of kainit, were free from scab.

With one exception liming and marling increased the yield of tubers in weight, and also their content in dry matter. The lime as well as the marl appeared to increase the yield of tops more than the yield of tubers. The proportion of dry matter in the tops and tubers varied from 1:3.05 to 1:3.7, the limed and marled plats invariably showing the narrower ratios.

The plants grown in limed and marled soil contained more nitrogen in the stems and leaves and a little less in the tubers than the check plants. The nitrogen content of the leaves and stems increased with the increase of magnesium carbonate applied in the fertilizer. The smallest quantity of phosphoric acid was found in the tops of plants grown on lime-free soil. The limed and marled soil also produced plants with a higher potash content in the tops than the soil not so treated. With the exception of 4 tests both substances apparently decreased the nitrogen and potash content of the tubers. Ground limestone reduced the lime and magnesia content of the portion of the plant above ground almost in proportion to the quantity applied. When magnesium carbonate was used in connection with lime the quantity of lime in the tops was reduced and that of magnesia increased. From this result the conclusion is drawn that magnesia may, within certain limits, replace lime in the plant organism. The lime content of the tubers was only slightly increased by heavy applications of lime and marl, while the magnesia content remained practically constant.

A study of the soil after the plants had been produced showed that only a small fraction of the soil supply of lime and magnesia had been removed in the crop.

Sansevieria, O. Barrett (*Porto Rico Sta. Circ. 1, pp. 4*).—A discussion is given in Spanish on the culture and uses of several species of sansevieria, or bowstring hemp, together with brief references to the value of maguey and sisal culture for Porto Rico.

Soy bean, N. Ssemenow (*Abs. in Chem. Ztg., 27 (1903), No. 93, Repert. 21, p. 302*).—In Manchuria from $\frac{1}{8}$ to $\frac{1}{6}$ of the land under cultivation is reported as devoted to this crop. Southern Russia is considered well adapted to the cultivation of the soy bean, which prefers a light deep soil and a dry climate. The average of 16 analyses shows

the following composition: Water 9.49, proteids 34.30, fat 17.67, nitrogen-free extract 28.44, cellulose 4.79, and ash 5.31 per cent. The crop is grown for forage and the production of oil.

The influence of environment upon the composition of the sugar beet, 1902, H. W. Wiley (*U. S. Dept. Agr., Bureau of Chemistry Bul. 78, pp. 50, dgms. 5*).—This season the work was discontinued at the Iowa Station, and at the Indiana Station the crop was a complete failure. In addition to the stations reporting results in 1901 (E. S. R., 15, p. 34) data were furnished in 1902 by the Colorado and California stations. In California the work was conducted at the Pomona Substation and on alkali soil at Chino. The results obtained in the humid and the irrigated regions are discussed separately. The average data of the season are given in the following table:

Average results with Kleinwanzlebener Nachzucht sugar beets grown under different conditions of soil and climate in 1902.

Locality.	Analytical data.				Meteorological data: May to October.		
	Weight.	Yield per acre.	Sugar in the beet.	Coefficient of purity.	Temperature.	Precipitation.	Sunshine.
	Ounces.	*Tons.*	*Per cent.*		*Degrees.*	*Inches.*	*Per cent.*
Lexington, Ky	8.0	8.9	7.3	70.9	69.3	16.6	76.1
Washington, D. C	22.9	26.1	8.4	72.4	68.6	23.5	67.0
Blacksburg, Va	15.4	16.7	11.7	74.4	65.8	15.2	....
Ithaca, N. Y	17.0	18.0	12.5	81.9	60.4	23.3	....
Madison, Wis	24.2	31.8	12.7	82.0	61.8	24.6	....
Agricultural College, Mich	10.6	12.5	13.5	86.9	60.5	27.4	58.0
Geneva, N. Y	14.3	16.1	13.9	84.5	63.1	20.2	....
IRRIGATION STATIONS.							
Fort Collins, Colo	19.7	24.0	13.0	79.4	60.0	14.8	62.5
Logan, Utah	13.0	14.4	13.4	80.4	60.3	4.2	78.5
Pomona, Cal	....	5.0	15.0	86.5	70.0	.59	70.0

Brief notes describing the soils on which the experiments are in progress are given, and the chemical and mechanical analyses of samples from these sources, made in the Bureau of Chemistry and in the Bureau of Soils of this Department, are reported. A summary of these data is shown in the table below:

Yield of sugar beets and soil data, 1902.

Station.	Yield per acre.	Chemical analysis.			Mechanical analysis		
		Potash.	Nitrogen.	Phosphoric acid.	Total sand.	Silt.	Clay.
	Tons.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Lexington, Ky	8.9	0.18	0.19	0.63	4.37	76.31	18.84
Agricultural College, Mich	12.5	.27	.07	.06	63.14	24.09	11.05
Geneva, N. Y	16.1	.73	.14	.09	35.23	28.47	32.06
Blacksburg, Va	16.7	.33	.10	.11	21.27	57.13	17.98
Ithaca, N. Y	18.0	.44	.12	.14	68.19	18.88	12.57
Washington, D. C	26.1	.39	.18	.03	45.24	33.02	21.40
Madison, Wis	31.8	.41	.10	.14	15.56	65.55	18.65
IRRIGATED SOILS.							
Pomona, Cal	5.0	.89	....	.23	....	....	....
Logan, Utah	13.0	.73	.10	.22	61.50	22.58	14.80
Fort Collins, Colo	24.0	.64	.15	.18	40.27	37.49	22.05

The geodetic data, excepting for the Colorado and California experiment fields, have been given in previous reports. At Fort Collins the average length of day from May to August, inclusive, is 14 hours 32 minutes, the latitude 40° 5′, and the altitude

4,994 ft.; and at Pomona, Cal., the average length of day is 14 hours 58 minutes, latitude 34° 3′, and the altitude 861 ft.

The results in 1902 are considered as confirming in a general way those of the 2 previous years. In their relation to the distribution of rainfall they indicate, according to the author, that the composition of the beet is largely independent of this factor, provided there is sufficient moisture to supply the growing crop.

At Madison, Wis., where the largest yield was obtained, the phosphoric acid content of the soil was higher than at any other station excepting Lexington, Ky., and Ithaca, N. Y. The quantity soluble in dilute acid, however, was largest at Madison. The potash content was higher only at Ithaca and Geneva, and the nitrogen content lower only at the Michigan Station. At Lexington, where the lowest yield was produced, the soil contained the higest percentage of phosphoric acid and nitrogen and the lowest of potash. The influence of a deficiency in 2 essential elements is shown by the results at the Michigan Station, where phosphoric acid and nitrogen were very low and the yields ranked next to the lowest. Potash and nitrogen were abundant in the soil at the Washington Station, while phosphoric acid was low, but this element was in a readily assimilable form and a yield of 26 tons per acre was obtained.

Judging the results with reference to the chemical composition of the soil, the previous conclusion that the soil is the least important factor in the environment of the sugar beet in respect to sugar content is again confirmed. It is stated that if well prepared both clay and sandy soil produce good beets, and that for this reason the beet is not well suited to determine the influence of mechanical composition of the soil on the yield. "A fundamental condition for the growth of beets is the preparation of the seed bed to a depth of at least 16 in."

The results on the alkali soil at Chino, Cal., show that beets of high quality can be produced upon soil containing at least 5,480 lbs. of alkali per acre-foot. Here as well as at Pomona the sugar content of the beets was materially reduced after October 1.

The average percentage of sugar in the beets was 2.4 per cent higher on the irrigated areas than at the other stations. Attention is called to the more equable temperature at the irrigated stations as compared with the nonirrigated areas, and this condition is considered favorable to securing a high content of sugar.

Method of harvesting sugar beets, RIEGER (*Abs. in Chem. Ztg.*, 27 (1903), *No. 93, Repert. 21, p. 302*).—The author recommends piling the beets into heaps about 3 ft. in diameter with all the leaves exposed. As the foliage withers the juices and the sugar are drawn back into the beet. This treatment practically prevents a loss in weight and gives an increase of about 1 per cent in sugar content. The beets are topped in the field and the tops and leaves are plowed under.

Seedling and other canes at Barbados in 1903, D. MORRIS (*Imp. Dept. Agr. West Indies, Pamphlet 26, 1903, pp. 69*).—A short account of the most important results of cooperative experiments with selected seedling and other canes is given. Part of the data obtained are presented in tables. The weather conditions of the season are discussed, and the rainfall of the different farms carrying on the work is recorded. It is stated that the results in general confirm those of previous years (E. S. R., 14, p. 653).

Experiments on wheat, R. H. BIFFEN (*Nature* [*London*], *69 (1903), No. 1778, pp. 92, 93*).—This article discusses the increase in the yield of wheat and the decrease in gluten content, and describes results obtained in wheat breeding which conform to Mendel's law. The effects of crossing on different botanical characters of the wheat plant as shown in certain experiments is pointed out, and examples in breeding early-maturing and rust-resistant varieties are cited.

Triticum pollonicum, ripening early in August when sown about the middle of March, crossed with Rivet wheat, ripening late in August when fall sown, resulted in hybrid grains which when sown March 15 produced plants maturing seed about the middle of September, or simultaneously with Rivet wheat sown at the same time.

Michigan Bronze and Red King, both liable to rust, were crossed with Rivet, which is practically immune. The following year the hybrids were severely attacked by rust and the grain produced was badly shriveled. From the seed of the Rivet and Red King cross 260 plants were grown, of which on June 15, 78 were free from disease, 118 slightly infected, and 64 badly attacked. June 29, when the epidemic seemed at its height, 64 plants were still uninfected and 195 were diseased.

These data lead the author to believe that the susceptibility of wheat to rust attacks is a Mendelian character.

Culture of wheat on the experimental fields of Grignon in 1902, P. P. Dehérain and C. Dupont (*Compt. Rend. Acad. Sci. Paris, 135 (1902), No. 17, pp. 654–657*).—The yields of small and large grains of a number of varieties of wheat were in all cases in favor of the large grains, but a large difference in yield was obtained only when there was a marked difference in the weight of the grains.

It was found in connection with this experiment that wheat lodged but not lying flat upon the ground ripened well and was equal in yield and quality to standing grain. A field on which fertilizers had been applied to the rows of beets was compared to a field upon which the fertilizer application had been uniformly spread. Early in the season the wheat following the beets was uneven in growth, being more luxuriant on the old beet rows, but later on this unevenness was effaced and the yield in grain and straw was slightly in favor of this field.

HORTICULTURE.

Influence of lime upon plant growth, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Bul. 96, pp. 23–44, pl. 1, fig. 1*).—A summary is given of the growth of a number of vegetables, flowers, small fruits, and trees planted on the acid soils at the station and fertilized with sulphate of ammonia or nitrate of soda, and either limed or left unlimed.

It was found that Lima beans grew well on a soil which was so acid as to entirely destroy lettuce, spinach, beets, onions, asparagus, muskmelons, and some other plants. The use of lime for these beans was found distinctly disadvantageous. Nitrate of soda and sulphate of ammonia were apparently equally effective with this crop. Pumpkins, squashes, asparagus, and rhubarb were all greatly benefited by liming, and in every case with these plants nitrate of soda proved more beneficial as a fertilizer than sulphate of ammonia. Fay and White Dutch currants were greatly helped by liming, as was also the Cuthbert raspberry. With the currants greater yields were obtained by the use of nitrate of soda than with sulphate of ammonia; but with the Cuthbert raspberry liming in connection with sulphate of ammonia gave better results on the whole than liming with nitrate of soda.

With the Ohio blackcap raspberry liming, with either nitrate of soda or sulphate of ammonia, appeared to be injurious. The results secured in liming the Snyder blackberry were conflicting; in some instances the yield was heavier on the limed soil and again upon the unlimed soil. The average results for 3 years favored the limed soil which received sulphate of ammonia. The blackberry, however, appears to thrive very well on acid soil. The yield of grapes appeared to be increased by liming on the sulphate of ammonia plat, but was not beneficial on the nitrate of soda plat. In both cases, however, liming appeared to increase the growth of the vines. The American Bell cranberry was positively injured by liming, and grew best where beets and onions failed. Acid soil seems to be best for this plant.

With flowers the poppy especially was greatly benefited by liming, as was also the pansy. In both cases, too, the best results were secured on the limed nitrate of soda plats as compared with the limed sulphate of ammonia plats. Zinnias were also benefited by liming on the nitrate of soda plat, but liming in connection with sulphate of ammonia did not prove helpful. The zinnias grew well on a soil so acid as to kill poppies.

Liming also appeared especially valuable in the case of the White Wonder Canada field pea. It was observed with this plant that nodules were abundant and quite evenly distributed upon the roots. On the unlimed plats only a very few nodules were found, and these were frequently of large size and tended to grow in clusters.

A home vegetable garden in the Palouse country, S. W. FLETCHER (*Washington Sta. Bul. 57, pp. 96, figs. 39*).—This bulletin has been written for the use especially of the inhabitants in the Palouse region of Washington. It encourages the making of gardens and gives detailed directions for the planting of all those vegetables commonly grown in kitchen gardens. It is based on the results secured at the experiment station in tests of varieties covering a number of years.

Such crops as tomatoes, melons, eggplants, squashes, pumpkins, and other tender vegetables can not be satisfactorily grown in the Palouse country without a hotbed. The necessity of thorough cultivation to preserve moisture in that region of scanty rainfall is pointed out, and the use of shallow-working tools like the spike-tooth cultivator, advocated. It has been found that Washington-grown cabbage, cauliflower, and onion seed give as good results as the best seed from other sections of the country. Puget Sound cauliflower seed has been found equal to the best Danish-grown seed. As a substitute for Lima beans, which do not mature in that region, the varieties Old Homestead and the English broad, or horse bean are suggested.

Cabbages must be started in a hotbed. The varieties Charleston, Wakefield, All Seasons, and Flat Dutch are recommended. The cultivated dandelions are recommended for greens during March and April. Endive is preferred to lettuce in midsummer. In the case of muskmelons extra-early varieties should be planted on quick soils. They should be given protection from late spring frosts and cold rains by means of hand boxes and the ends of the vines pinched. Onions grown from seed sown in the open field can not be depended upon to ripen well. By sowing in a hotbed and transplanting very early, the crop has been grown cheaper and the bulbs have regularly ripened. Australian Brown, Prizetaker, and White Pearl are recommended. For the purpose of tillage it is recommended that all peas, even the dwarf forms, be trellised. Only the early varieties of pumpkins mature. They should be started in a hotbed. Early Sugar is recommended.

Hubbard squash is not sure to mature. Better results have been secured with Boston Marrow and Marblehead. These should be started in boxes and succession sowing practiced. Nearly all varieties of summer squash do well. With tomatoes only the earliest varieties ripen. The plants when transplanted to the garden should be large and stocky and have several blossoms already formed on them. Train to a single stem. Rich soils and a northern slope are recommended for this crop. All side shoots of the vine should be kept pinched off and the vines topped to set 4 to 5 clusters of fruit. This practice hastens the ripening period. Watermelons, like muskmelons, should be started in the hotbed and hand boxes used to protect them in the field. Cole Early is considered one of the most reliable varieties.

Vegetables under cheese cloth, W. T. MACOUN (*Gardening, 12 (1904) No. 273, pp. 517, 518*).—The author reports the results of experiments in growing a number of different vegetables under cheese cloth shade at the Central Experimental Farm in Canada. Lettuce grew equally well inside and outside the enclosure, but was 2 to 4 days earlier when grown outside. The yield of beets was more than twice as heavy when grown outside the enclosure, though the tops were about equally large in both cases. Radishes were ready for use inside about 3 days before those outside. The radishes inside were perfectly free from maggots, while those outside were practically worthless from this cause. Beans also were ready for use earlier inside than outside, and were nearly as productive.

Experiments with eggplants, watermelons, and muskmelons were a failure both inside and outside, owing to the inclemency of the season. No cucumbers set inside the tent until the cloth was torn and insects admitted. Maggots, which badly affected cauliflower outside, were entirely absent on cauliflower grown inside the tent. Toma-

toes grew well inside the tent and were 6 days earlier than those grown outside, but were not so robust. Corn grew more rapidly inside than out at first, but later on was not as robust.

Some data are given showing the average temperatures during the summer months up to September 1, inside and outside the enclosure. The temperature was usually a little higher inside than out, the greater difference in any one case was 9°.

In conclusion it is stated that "cheese cloth enclosures may be of value in cities and towns where it is difficult to have a garden owing to the injury done by cats, dogs, and even young children. Vegetables will probably be tenderer, as a rule, grown inside an enclosure, though this was not the case this season owing to the wet weather. It may be useful to market gardeners for growing vegetables which are affected by root maggots."

A test by Graham Bell, at Cape Breton, Nova Scotia, is noted in which it was found that lettuce and beans were tenderer when grown under shade and that tomatoes ripened earlier, although the crop was not as large as that grown outside.

The culture of vegetable crops in the market and home gardens, W. F. Massey (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 11, pp. 78*).—The author discusses this subject with especial reference to the needs of North Carolina cultivators. All the different phases of trucking and market gardening are discussed, with specific directions as to varieties and cultural methods best suited for all the more common vegetables usually grown in trucking.

The vegetable garden, J. E. Morse (*Rochester, N. Y.: Vick Pub. Co., 1903, pp. 30*).—Brief directions are given for the location and preparation of the vegetable garden and for the planting and culture of vegetables and small fruits.

Kitchen and market gardening, L. Bussard (*Culture potagère et culture maraichère. Paris: J. B. Baillière & Sons, 1904, pp. 503, figs. 172*).—This is a popular work on the culture of all of the more common market garden crops. It purports to give all of the latest information on this subject.

A Pennsylvania celery farm: Heavy fertilizing in a swamp (*Rural New Yorker, 62 (1903), Nos. 2809, p. 817; 2810, p. 834; 2811, pp. 850, 851; 2812, pp. 865, 866, figs. 3*).—An account is given of the method of celery culture observed on the farm of A. R. Niles, Tioga County, Pa. The land was originally a worthless swamp. A very successful celery farm was made out of it by thorough drainage and the use of large amounts of commercial fertilizers irrespective of any natural fertility of the land. Potash was found to be the element of most importance in the culture of celery on this land.

Generally a complete factory-mixed fertilizer is used, applications of as much as 3,000 lbs. per acre being sometimes employed. About half the fertilizer is used broadcast and half drilled 4 to 5 in. deep in the celery rows before the plants are set above it. Small dressings of lime and ashes have also proved very beneficial on this soil. The success of the industry is attributed to the fact that the soil is used mainly as a medium in which to grow the plants, and the crop fertilized as heavily as though the soil were absolutely sterile. Golden Self-Blanching is the variety principally grown.

Peas in pots and frames with varieties, G. Wythes (*Amer. Gard., 25 (1904), No. 466, p. 21, fig. 1*).—Directions are given for growing early peas in pots and frames, with notes on some of the better varieties used in England for this purpose.

The genus Phaseolus; its garden varieties, Denaiffe (*Jour. Soc. Nat. Hort. France, 4. ser., 4 (1903), Apr., pp. 222–243*).—An account is given of the botanical characteristics, the distinguishing features of the principal varieties, diseases, culture, etc., of kidney beans (*Phaseolus vulgaris*), Lima beans (*P. lunatus*), and the scarlet runner bean (*P. multiflorus*).

What the introduction of foreign varieties of fruit has done for the horticulture of the Northwest, H. C. Price (*Jour. Columbus Hort. Soc., 18 (1903), No.*

4, pp. 152–156).—The attempt to raise hardy varieties of fruit in the Upper Mississippi Valley led to very extensive importations of Russian fruits by Professor Budd, of the Iowa Agricultural College, in 1882. These fruits have been tested now in different portions of the Northwest for more than 20 years, and the author gives an estimate of their value as a factor in horticulture in the Northwest.

It is stated that in the southern part of Iowa and in the same latitude in adjoining States, the Russian fruits have not proved as satisfactory as American varieties of eastern origin; while in the northern part of Iowa and in southern Minnesota and Dakota their introduction has proved a boon, since the Russian sorts are the only varieties that will grow. One of the most important results of the introduction of Russian fruits, however, has been in the impetus it has given to plant-breeding work, in which the attempt has been made to combine the good qualities of the native American fruits with the hardiness, thrift, and productiveness of the Russian fruits.

Of the 100 or more varieties of Russian apples introduced by Professor Budd, only a few have proved really valuable. Among the more important of these are Long Field, Anisim, Antonovka, Charlamoff, Hibernal, Tetofsky, and Liveland Raspberry; and of the 50 varieties of cherries the valuable varieties are Sklanka, Duchess d'Angoulême, Brussler Braune, and Spate Amarelle.

In conclusion, it is stated that while the immediate results obtained from the introduction of the Russian fruits has been far from what had been hoped, nevertheless the experiment has paid for itself many times over, and it is believed that still greater results will yet be obtained by the crossbreeding of the Russian and American fruits.

Catalogue of fruits (*Proc. Georgia State Hort. Soc., 27 (1903), pp. I–XIX*).—This is a catalogue of all of the fruits and nuts grown in Georgia, with estimates as to their value in different localities, season of ripening, etc.

Victorian fruit in London, J. M. SINCLAIR (*Jour. Dept. Agr. Victoria, 2 (1903), No. 2, pp. 149–157*).—This is an account of shipments of apples, pears, and grapes to London in a number of different steamships, and the prices received for the fruits.

Growing fruit trees in pots, W. TURNER (*Amer. Agr., 72 (1903), No. 20, p. 403, fig. 1*).—The author has successfully grown in pots the following list of fruits: *Plums.*—Golden Esperen, Jefferson, Denniston Superb, Green Gage, Grand Duke, Mallard, The Czar, Early Transparent, and Pond Seedling. *Pears.*—Fertility, Magnate, Conference, Princess, Souvenir du Congress, Louise Bonne de Jersey, Pitmanston, Duchess, Buerre Diel. *Apples.*—Williams Favorite, Ribston Pippin, Benoni, Mother, King of the Pippins, Washington, Tompkins King, Belle de Pontoise, Bismarck, Gascoigne, Scarlet, Werner King, Peasgood Nonesuch, Lady Henniker, Bijou, Thomas Rivers, Cox Pomona, Alexander. *Figs.*—Black Marseilles, Brown Turkey, Early Violet, Negro Largo, White Marseilles.

Self-sterility in fruits (*Amer. Agr., 72 (1903), No. 26, p. 567*).—The opinions of S. D. Willard, F. A. Waugh, and J. W. Kerr are here given on the matter of self-sterility in Japan plums. Mr. Willard has found them self-fertile, with the exception of October purple. Professor Waugh states that in his experiments with Japanese plums he did not find a single variety which was reasonably self-fertile, and he looks upon the mixing of varieties for the purpose of cross pollinating the flowers as a kind of insurance rather than an absolute necessity in all cases. Mr. Kerr holds that nearly all kinds of fruits are self-sterile in some localities, and that Japanese plums are no more reliable in this respect than are apples, cherries, grapes, etc. Practically every kind of fruit, in his experience, except perhaps the Kieffer pear, has proved self-sterile when protracted rainfall prevails at blooming time.

On the relation of moisture content to hardiness in apple twigs, F. T. SHUTT (*Sep. from Proc. and Trans. Roy. Soc. Canada, 2. ser., 9 (1903–4), Sec. IV, pp. 149–153*).—Horticultural writers in recent years have urged the necessity of stopping cultivation of orchards in late summer and the planting of some cover crop for the purpose of withdrawing moisture from the soil and thus "ripening" up the wood to

prevent winter injury to the trees. It is generally believed that those varieties whose growth ripens best will prove the hardiest. It was thought, therefore, that the moisture content of the twigs of an apple tree as winter approaches would be an indication of its power to resist frost. In order to test the matter, twigs were selected from 10 varieties which contained representatives of sorts which were practically frost-proof, sorts which are killed back in severe winters, and sorts which suffer every winter to a greater or less degree.

In the first group were Duchess of Oldenburg, Yellow Transparent, and McMahon White. Varieties which were considered less hardy than these were Wealthy, Scott Winter, Scarlet Pippin, and Walworth Pippin. The varieties Hebble White, Boy Delight, and Blenheim Pippin were selected as least hardy of the 10. The twigs of these different varieties were examined every 2 weeks from January 23 to May 15. The percentage of water in the basal and terminal portions of the twigs and in the whole twig is shown in the following table:

Water in apple twigs in winter.

Variety.	Basal portion.	Terminal portion.	Whole twig.
	Per cent.	*Per cent.*	*Per cent.*
McMahon White	44.87	46.95	45.79
Yellow Transparent	45.19	46.60	45.82
Duchess	44.94	47.48	46.00
Walworth Pippin	45.36	48.18	46.58
Boy Delight	45.28	48.47	46.75
Wealthy	47.31	48.74	48.06
Scott Winter	46.95	49.44	48.21
Scarlet Pippin	47.00	49.65	48.23
Hebble White	48.58	50.31	49.74
Blenheim Pippin	49.12	51.15	50.01

After the winter was over it was found that of the trees under examination 3 only showed winterkilling, the other 7 varieties proving hardy to the tip. The tender varieties were (1) Boy Delight, with terminal buds killed and twigs in a few instances killed back 3 in.; (2) Hebble White, showing terminals of twigs in every instance killed back about 3 in.; (3) Blenheim Pippin, the tenderest of all, with terminal buds killed and wood killed back 3 to 6 in. or more. The data obtained in the investigation would therefore, in the opinion of the author, seem to show "that we have direct and definite proof that there is distinct relationship between the moisture content of the twig and its power to resist the action of frost, and that those trees whose new growth contains the largest percentage of water as winter approaches are in all probability the most tender.

"Further, it seems likely that if hardiness is dependent upon the degree of ripeness of the new growth (indicated by moisture content), then it is quite possible that it is a quality that can be materially affected by judicious cultural methods. Hardiness is evidently something more than an inherited tendency. It seems probable that it is a quality largely under the influence of the soil condition as regards moisture and temperature in the late summer and autumn months, and probably these factors rather than the severity of the succeeding winter determine the tree's immunity from frost. If in northern latitudes vegetative growth be early arrested and ripening of the new wood thus induced, either by artificial means (pruning and cover crops), or by a dry and cold autumn, varieties now considered tender might prove hardy."

The work is to be continued and the examinations of the twigs begun earlier in the season.

The composition of apple pomace from Cornouailles in 1903, J. CROCHETELLE (*Jour. Agr. Prat., n. ser., 6 (1903), No. 49, pp. 730, 731*).—The density of juice obtained from pressing cider apples is reported, as well as the amount of reducing substances and starch per liter, the composition of the juice being discussed in relation to the maturity of the apple crop.

Graft hybrid between the pear and quince, L. DANIEL (*Jardin, 17* (*1903*), *No. 404, p. 372, figs. 5*).—A number of pear trees grafted on quince stock were cut back to near the ground. As a result, several shoots sprang up near the original grafts. One of these shoots partook in a large measure of the combined outward characters of both pear and quince. This is described as a graft hybrid. Illustrations are given of the leaves of the normal pear and quince and of the graft hybrid thus obtained.

Hybrid oranges from Louisiana, J. L. NORMAND (*Amer. Gard., 24* (*1903*), *No. 461, p. 669*).—The author states that he has made crosses with *Citrus trifoliata* as follows: (1) Satsuma × *Citrus trifoliata*, (2) Mandarin × *C. trifoliata*, (3) Navel × *C. trifoliata*, (4) Boone Early × *C. trifoliata*, and (5) Ponderosa × *C. trifoliata*. These crosses have been made during the past 10 years, and a sample of each of the fruits thus far obtained from the crosses was sent to *American Gardening*, which describes them as follows:

"The hybrid Ponderosa and *C. trifoliata* (5) is a fruit $3\frac{3}{4}$ by $3\frac{1}{4}$ in., partaking more of the general appearance of the lemon than what is generally known as an orange. It has an aroma like that of the grape fruit and is about the same in color, being a pale greenish yellow and having a coarse-looking surface. The hybrid Navel and trifoliata (3) gives us a fruit 2 by $2\frac{1}{2}$ in. of a fine, deep golden yellow color, but with a pungent odor. The Mandarin and trifoliata (2) recalls the Mandarin in size and general appearance of the skin, as well as in odor. A cross of Boone Early and trifoliata (4) gives a typical richly colored sweet orange, $2\frac{3}{4}$ by $2\frac{1}{2}$ in., a very handsome fruit. The hybrid Satsuma and trifoliata (1) is like a small-sized sweet orange, 2 by $2\frac{1}{8}$ in. Compared with the Satsuma parent it is more rounded, the skin more tender, and the color rather near the golden yellow."

Mr. Normand also secured an early-fruiting variety of pecan by crossing the Louisiana thin-shell pecan and the French dwarf Preparturien walnut.

On the budding of mangoes, T. J. HARRIS (*Bul. Dept. Agr. Jamaica, 1* (*1903*), *No. 11, pp. 253–255*).—A successful method of budding mangoes is described. The essentials to be observed are as follows:

"That both the stock and the tree yielding the buds be growing rapidly. That the bud wood be a little larger in diameter than the stock to insure the area on the under side of the actual bud being brought into close contact with the wood when tied in; if the bud wood be less in diameter than the stock, a hollow space will occur between these parts that should be closely applied; acting with this against success is the thinness of the bark of the younger wood and the consequent impossibility of tying in closely. That the bud be tied in tightly, especially at the points just below and above the bud proper, but yet not tight enough to crush or bruise the bark. That the piece of bark containing the bud be removed from the wood without bruising, bearing in mind that the bending will bruise or crush the cells of a plant. That the moisture be retained in the bud during the time required to join up by using tying material that will prevent evaporation, i. e., waxed tape. This is made by dipping three-eighths in. tape into a melted mixture of 1 lb. beeswax, a piece of resin the size of a hen's egg, and half a wineglass of raw linseed oil; scraping off the superfluous wax with a dull knife after cooling. The bud wood should be near the stock to insure no time being lost between the taking off of the bud and its insertion in the stock."

The bud wood used should be 4 to 6 seasons old and 1 to $1\frac{1}{2}$ in. in diameter, and in any case larger than the stock on which it is to be grafted. The piece of bark containing the bud in the center is made about 3 in. long and three-fourths in. wide. Large seedling trees may be cut off and the sprouts arising from the stump budded. Not more than 3 sprouts should be allowed to grow to each stump. In placing the bud on the stock care should be taken to make a space large enough so that the bud patch can be moved slightly from side to side and up and down. Union takes place

under the bud and not at the sides. If the bud is still green 2 weeks after budding the whole of the stock above the bud may be cut off.

The Georgia fig; its possibilities and promise, H. N. STARNES (*Proc. Georgia State Hort. Soc., 27 (1903), pp. 46–58*).—This is a popular account of the possibilities of the fig industry in the South, with a discussion of the different classes of figs, method of propagation, pruning and training, winter protection, diseases, varieties, etc.

Irrigation in small fruit growing, C. DECKNER (*Proc. Georgia State Hort. Soc., 27 (1903), pp. 34–38*).—The method followed by the author in irrigating 20 acres of orchard and gardens in Georgia is described. On light, loose, sandy soil the application of the water by sprinkling is advocated, but where the soil is heavy and inclined to bake it is held that the water should be applied in narrow furrows between the rows of the crop.

In the plant described the water is delivered to the field direct from the pump in a 2-in. iron pipe. In the case of strawberries, holes are made in the pipe at proper intervals so that 10 or 12 rows can be irrigated at one time. The water is kept running slowly until the ground is thoroughly saturated.

Growing fancy strawberries, F. E. BEATTY (*West. Fruit Grower, 13 (1903), No. 3, pp. 1, 2, fig. 1*).—The 5 principal varieties grown by the author are Warfield for the early sort, fertilized by Michel Early and Lovett Early—1 row on each side with 3 rows of Warfield between—followed by Clyde and in turn by Gandy. The 3 varieties—Warfield, Michel Early, and Lovett Early—are grown preferably on rich, sandy loam with a southern exposure. All these varieties are inclined to run to vine, and to prevent this as much as possible plants are selected that show a tendency of strong fruiting-bud power. The largest crowned plants which stool low to the ground are selected. The fertilizers used for these sorts are much richer in phosphoric acid and potash than in nitrogen.

In the case of Clyde, which has a fault of producing more fruit than foliage, plants are selected which show a disposition to run to plant and runners, rather than those showing a tall upright position. In setting out plants of this variety the soil is first heavily fertilized with composted manure, which is then plowed under and a crop of cowpeas grown. The peas are turned under in the fall and the ground dressed with about 50 bu. of wood ashes per acre. The plants are kept thoroughly cultivated throughout the summer, and the following spring are fertilized with about 75 lbs. of nitrate of soda per acre when the straw is taken off them. With the Gandy variety, low heavy-crowned plants are used and a much more sparing application of nitrogenous fertilizers made. Instead, larger quantities of bone meal and muriate of potash are used.

In picking for market the berries are graded in the field. The picker is furnished with a stand with 4 boxes, 3 of which receive the first-grade fruit as picked, and the other the second-grade fruit.

Ringing the currant vine, T. HARDY (*Jour. Dept. Agr. Victoria, 2 (1903), No. 2, pp. 147, 148*).—The author states that in South Australia it has been definitely proved that not only larger crops but also larger-sized berries are obtained as a result of ringing the currant grape. In some instances the crop has been increased one-half by ringing. On the other hand, the ripening of the fruit has been retarded from 10 days to 2 weeks, and the grapes from ringed vines are distinctly less sweet and lighter in color. The weakening effect of ringing on the life of the vine is discussed.

Definite experiments on this phase of the problem appear to be wanting. The author has found, however, that a simple incision without removing any of the bark has proved as effective in increasing the yield as when a ring of bark was removed, and caused considerably less injury to the vines. In whatever manner the ringing is done it is held that it should be made when the vine is in bloom, as

it seems that the check then given causes the setting to be more satisfactory. Weakly vines should not be ringed in any case. This process should be reserved for only the more vigorous vines.

Specific variations of grapes, A. JURIE (*Rev. Vit., 20 (1903), No. 520, pp. 647–652, figs. 9*).—An account is given of a number of specific variations in the normal product obtained by grafting grapes. Illustrations are given of several of the more striking results obtained, showing reciprocal action between stock and scion. The author states as a result of his investigations that the graft is a more certain and more powerful means of hybridization than sexual hybridization, and that, as with herbaceous plants, it may be carried out with a perfectly definite end in view.

On the variations in grafted vines, L. RAVAZ (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 51, pp. 743–750, figs. 8*).—A controversial article in which variations in vines alleged to be due to grafting are considered by the author to be due to ordinary causes of variation.

Morphological variations in the leaves of grapes as a result of grafting, A. JURIE (*Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 52, pp. 764–767, figs. 3*).—An illustrated account is given of observations along this line.

Direct producers and fruitfulness, J. M. GUILLON (*Rev. Vit., 20 (1903), No. 521, pp. 671–675*).—This is an account of the yields of a number of varieties of direct producers on different soils. In some cases analyses of the product as regards alcohol and acid contents are given. Very unsatisfactory results have been reported with direct producers on chalky soils; in one locality on such soils they were gradually destroyed by phylloxera. In another instance on deep clay soils they gave very poor results.

In a third case on the low, rich plains in the neighborhood of Cognac, where the vineyards are submerged during a portion of the winter, thus protecting them in part from the attacks of the phylloxera, better results were obtained. In this case the soil contained about 25 per cent of lime with considerable clay. The test was made in a very exposed situation with pure vinifera sorts in comparison with direct producers. Late frost killed the growing shoots of the vinifera vines so that not a single berry was produced. The direct producers, however, made a fairly good crop from which an excellent grade of wine was made. One of the noticeable features of the direct producers under observation was their tendency to produce fruit from the base of the vine to the extremities. Analyses are given of several samples of the grapes from direct producers, with reference to alcohol, acidity, must, skin, seeds, etc.

Improvements in methods of bench grafting, E. H. TWIGHT (*Pacific Fruit World, 17 (1904), No. 15, p. 11*).—Good results in the bench grafting of resistant varieties of grapes seem to be difficult to obtain owing to the care which must be taken in performing the numerous details involved. In this article the author describes quite completely the method, previously noted (E. S. R., 14, p. 1071), of packing the grafts in a mixture of moss and charcoal and forcing them into growth by the aid of artificial heat before transplanting them to the nursery.

It is believed by the writer that by this method from 50 to 75 per cent of the grafts made will be successful. Not only can this comparatively high percentage be obtained, but the necessity of wrapping the graft when made is done away with and a much better callus secured. It is proposed to undertake experiments at the California Experiment Station on a commercial scale along this line.

Influence of the soil on the composition of the tea leaf and the quality of the tea, I, A. W. NANNINGA (*Meded. 's Lands Plantentuin, 1903, No. [illegible], pp. [illegible]*).—The author refers to previous work on this subject, especially to that of Bamber and Mann. The former stated that the presence of iron compounds in the soil was favorable to a higher quality in the tea, while no relation could be found between the presence of phosphoric acid, potash, and lime in the soil and the quality of the tea.

The author took samples of tea leaves from several plantations having similar cli-

mate and altitude conditions but different soils. The leaves were gathered and at once dried in the sun. They were then sent to the laboratory, ground, and subjected to analysis for iron, nitrogen, phosphoric acid, silicic acid, caffein, and ash. The various soils from each plantation were also analyzed—the surface soil to 20 cm. deep, and the subsoil 20 to 50 cm. deep. Preliminary analysis of leaves of different ages, but all of proper age for gathering, showed that great care is necessary to have all the leaves of the same age, since some of the substances varied greatly with the age of the leaves.

Some of the conclusions of the author are as follows: (1) The chemical composition of the soil, especially the quantities of those substances taken up by the plant, has an influence clearly demonstrable by chemical analysis on the composition of tea leaves produced on such soil. (2) This influence is most clearly marked in the case of manganese, but also for phosphoric acid, lime, and magnesia. (3) In general, a soil poor in one of these plant foods produces leaves that contain less than an average amount of this substance, while soils that are rich in these plant foods produce leaves containing larger amounts of these substances, up to a certain maximum.—H. M. PIETERS.

Plants cultivated for the preparation of aromatic drinks. Tea, F. A. VON STÜRLER (*Cultura, 15 (1903), No. 177, pp. 174–188, pls. 2, figs. 4*).—This is a full discussion of tea culture, including botanical descriptions, soil and climatic requirements, propagation, insects and diseases, harvesting, pruning, drying, fermenting, and other matters connected with the preparation of tea; as well as with its testing, mixing, and packing.—H. M. PIETERS.

Coffee (*Der Kaffee. Berlin: Julius Springer, 1903, pp. VI+174, figs. 7, map 1*).—This book, which is issued by the Imperial Health Office, contains information on the botany and chemistry of coffee, methods of harvesting and preparing coffee for the market, the adulteration of coffee, physiological effects of coffee and coffee substitutes, and German laws relative to coffee and coffee adulteration. In addition, certain statistics are given on the production of coffee in different countries and on the consumption of coffee.

Cacao: Its culture and preparation, with special reference to Samoa, C. ETTLING (*Der Kakao. Berlin: Dietrich Reimer (Ernst Vohsen), 1903, pp. V+39, pls. 3*).—An account of methods of cacao culture in Samoa, from the planting of the seed to the fermentation and drying of the cacao beans.

Cocoa in Trinidad and Grenada, P. PREUSS (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 4, pp. 73–76*).—This is a note taken from the recent report of Dr. P. Preuss (E. S. R., 14, p. 662) on the use of shade in the culture of cacao trees in these localities and on the methods of cultivation and pruning observed.

The culture of cacao and its enemies, L. KINDT (*Die Kultur des Kakaobaumes und seine Schädlinge. Hamburg: C. Boysen, 1904, pp. 157, figs. 38*).—This book is intended for the use of practical planters in the growing of cacao. It contains complete cultural directions, including the use of intercultural and leguminous crops and shade trees, and descriptions of the more injurious insects and fungus diseases affecting cacao, with recommendations as to methods for their control.

India rubber and gutta-percha, H. FALCONNET, T. SEELIGMANN, and G. L. TORRILHON (*London: Scott, Greenwood & Co., 1903, pp. 402, figs. 86*).—About two-thirds of this book is devoted to India rubber and one-third to gutta-percha. Both of these subjects are considered with reference to their historical, botanical, arboricultural, mechanical, chemical, and electrical aspects. Special emphasis has been laid on the chemistry and commercial uses of these materials. A bibliography of 404 sources of information on these subjects is appended. This is the English edition of the work, which has been translated from the French by J. G. McIntosh.

Rubber planting on the Isthmus of Tehuantepec, H. C. PEARSON (*New York: The India Rubber Pub. Co., 1903, pp. 27, figs. 45, map 1*).—This is a record of a journey

on the Isthmus of Tehuantepec in which a number of typical rubber plantations were visited and the methods followed in Castilloa rubber production observed. Considerable other information on the nature of the country, labor problems, etc., is included.

Para rubber seed (*Agr. News [Barbados], 2 (1903), No. 43, p. 392*).—A letter by F. J. Holloway is reprinted from the Agricultural Bulletin of the Straits and Federated Malay States, in which it is stated that an investigation was made as to whether the tapping of a Para rubber tree caused the seed to be of less value for planting than the seed obtained from trees which had not been tapped. After testing the matter with seeds from both tapped and untapped trees, his experience leads him to conclude that there is not the slightest difference in the resulting trees grown side by side for the past 4 years.

Para rubber extraction (*Jour. Jamaica Agr. Soc., 7 (1903), No. 10, pp. 401–404*).—Experiments by A. D. Machado are reported, in which it was found possible to tap Para rubber trees every second day for 6 months in every year without in the least hurting or impairing the growth of the tree and at the same time secure the greatest possible amount of latex.

Instead of the "herring-bone" gash, which is commonly used in tapping these trees, Mr. Machado found that the best results were obtained from a series of incisions not more than 1½ in. long and ⅛ in. wide. The flow of the latex has been found more copious on the morning of a day following a heavy shower of rain than on a dry day. In fact, in very dry weather it may be advisable to cease tapping altogether. Tapping is usually begun at 6 o'clock and continues for a half hour. At 7 o'clock the cups are gathered in and the latex passed through a sieve to insure cleanliness, after which a small amount of acetic acid is added to hasten coagulation and the latex then poured into enamel soup plates. Coagulation is usually complete within a half hour.

The English walnut in southern California, Elizabeth A. Ward (*Amer. Mo. Rev. of Reviews, 29 (1904), No. 168, pp. 64–67, figs. 4*).—This is a popular account of methods of growing English walnuts in southern California, and of harvesting, bleaching, and marketing the crop. It is stated that 1,500 lbs. of nuts per acre, or about 75 lbs. per tree, is a good average yield.

Walnut culture and walnut blight (*Pacific Fruit World, 17 (1904), No. 14, p. 12*).—The writer has found the greatest profit in walnut growing when the trees were set 40 ft. apart each way. The cost of producing nuts with trees this distance apart was at the rate of \$2.77 per cwt., with trees 44 ft. apart \$3, and with trees 50 ft. apart \$3.58 per cwt. An instance is cited in which the addition of lime at the rate of 20 tons of air-slaked lime from a sugar-beet factory greatly increased the yield of nuts.

In 1902 two sprayings with Bordeaux mixture, once just before the leaves came out and once after the nuts were well set, resulted in 50 per cent less of infected nuts than where trees were left unsprayed. In 1903 the same orchard sprayed but once, just before the trees leaved out, produced 34 per cent less of infected nuts than unsprayed trees. The cost of spraying a 12-year-old walnut orchard was 21 cts. per tree for the first spraying and 39 cts. per tree for the second. The cost of applying the spray, using a power sprayer, 6 men and 4 horses, was about ¼ ct. per gal. for material and labor.

Walnut and filbert growing, J. B. Pilkington (*Northwest Hort., 17 (1904), No. 1, p. 9*).—This is a paper read by the author before the Northwest Fruit Growers' Association, in which the growing of walnuts and filberts in Oregon is discussed. The author states that the culture of walnuts has spread from northern California into southern Oregon, and that this northward extension of walnut growing is based upon the use of the best French varieties, since these varieties are hardier in resistance to frost and to leaf burn from summer heat.

The varieties Praeparturiens, Franquette, Mayette, Chaberte, and Parisienne have all been successfully grown in Oregon. These varieties are all late bloomers and often bear full crops when the tender soft-shell varieties are destroyed by frost. The nuts are of good size and flavor, and while not as large as the paper and soft shell varieties, they are considered equally good. The trees are reported free from the bacteriosis which seriously affects soft-shell nuts in California. Trees come into bearing 6 to 8 years after planting.

Relative to filbert culture the author mentions 1 plantation in Oregon, planted with the Barcelona variety, in which the yield was upward of 15 lbs. of nuts per tree. At this rate filbert culture is believed to be more profitable than prune culture. Other good varieties of filberts are the red and white Avelene and the Du Chilly. They are described as good and prolific bearers, thin shelled, hardy, early, and free from pests.

Grafting chestnuts (*Amer. Agr.*, *72* (*1903*), *No. 24*, *p. 503*).—A writer states that in grafting chestnuts on sprouts in cut-over land he has secured a growth of 85 to 97 per cent of the scions set. The scions for grafting are cut late in winter and kept in moist sawdust in a cool place. Grafting takes place after freezing weather is over and the buds are just beginning to expand. Whip or tongue grafting is preferred. The graft should be well covered with grafting wax.

Relations of climate to horticulture, J. W. Smith (*Jour. Columbus Hort. Soc.*, *18* (*1903*), *No. 4*, *pp. 143–151*).—A number of tables are given. One table shows the monthly and annual mean temperatures at Wauseon, Ohio, for the years 1870 to 1902, inclusive; another shows the total monthly and annual precipitation from March 1871 to 1902, inclusive; and a third shows the dates of blossoming of apples, peaches, pears, plums, and cherries at that place for the years 1877 to 1903.

Report of the first meeting of the Society for Horticultural Science (*Amer. Gard.*, *25* (*1904*), *No. 466*, *pp. 25, 26*).—This is a report with abstracts of the papers and discussions presented at the recent meeting of the Society for Horticultural Science, held at St. Louis, December 28 and 29, an account of which is noted elsewhere (E. S. R., 15, p. 538).

On the use of ether and chloroform for the forcing of shrubs and of lilacs in particular, E. Lemoine (*Jour. Roy. Hort. Soc.* [*London*], *28* (*1903*), *No. 1–2*, *pp. 45–51*).—This is a review of European experimental literature on the forcing of plants by the use of ether and chloroform.

Tried to force by ether and failed, J. Hutchinson (*Amer. Gard.*, *24* (*1903*), *No. 463*, *p. 702*).—An account is given of an attempt made to force Lily of the Valley pips after subjecting them to etherization as a substitute for freezing. Well-matured pips were lifted before frost and the plumpest selected and treated to ether for 72 hours, after which they were put in a dark place and kept at a temperature of 80° with strong bottom heat. The results were not satisfactory, as the pips did not respond to the heat and moisture as they would have done had they been well frozen.

SEEDS—WEEDS.

The Georgia seed-growing industry, N. L. Willett (*Proc. Georgia State Hort. Soc.*, *27* (*1903*), *pp. 15–28*).—This is a popular account of the seed industry in Georgia. The cultural methods observed in growing crops for seed are given for the following plants: Collards, turnips, mustard, okra, pearl millet, cotton, oats, burr clover, chufas, asparagus, melons, second-crop Irish potatoes, beardless barley, rye, multiplying onions and shallots, Mexican June corn, Spanish peanuts, upland rice, Johnson grass, vetches, sorghum, cowpeas, Lima beans, peaches, etc.

The author holds that second-crop Irish potatoes which are obtained from plantings made in July or August are much better for seed in the Southern States than the best Maine-grown sorts.

Sainfoin, D. FINLAYSON (*Aynsome Agr. Sta., Grange-over-Sands, Cent. Seed-Testing Lab. Farmers' Bul. 4, pp. 7, figs. 8*).—A description is given of a sainfoin (*Onobrychis sativa*) and its variety, the giant sainfoin. Descriptive notes are given of the seed of sainfoin and the more common adulterants are briefly described. The seed of sainfoin should have a purity of at least 98 per cent and a germination of 88 to 90 per cent.

Report of the Seed Control Station at Lund, Sweden, for 1902, B. JÖNSSON (*Kvartalsskr. Malmöhus Läns K. Hushåll. Sälsk., 1903, No. 1, pp. 132–143*).

Report of the Wermland County Seed Control Station, Chemical Laboratory, and Milk Control Station at Molkom for 1902, J. A. ANDERSSON (*Red. Verm. Frökontrollanst. och Kem. Lab. Molkom, 1903, pp. 30*).

The weed problem: Some observations and experiments, E. KORSMO (*Tidsskr. Norske Landbr., 10 (1903), Nos. 6, pp. 247–280; 7, pp. 295–330*).—The material of this report is arranged in 2 parts, the first describing the author's observations in different Scandinavian countries, the second giving the results of his investigations in Norway.

Among the investigations the author reports on the influence of weeds on the yield and money value of different crops. These observations include 3 crops, grass, barley, and potatoes, grown on different plats, each comprising areas of the same size and same crop, one of which served as an example of clean land and the other of weed-infested land. The harvested product was carefully weighed and calculated to the yield per hectare, and the following results were obtained:

Effect of weeds on yield and money value of crops.

Crop.	Yield per hectare.		Percentage lost in money value.
	Clean.	Weedy.	
	Kg.	*Kg.*	*Per cent.*
Hay	6,180	[a]1,740 + 2,890	47
Barley:			
Grain	2,286	833	46
Straw	3,795	[a]1,735 + 2,407	
Potatoes	22,101	11,330	49

[a] Weight of weeds included with hay and straw.

Investigations were carried on to determine the number of viable weed seeds in a square meter of a fallow field to the depth of 25 cm. As determined by 3 different weedings, the viable weed seeds in the field investigated were 10,332 per square meter. In the field intended for spring grain, the same crop having been sown for 4 successive years, 33,574 viable seeds were found per square meter. In a third field, which was fallowed, the viable weed seeds found were 1,755.

Some experiments are reported on the effect of grinding screenings for the destruction of the weed seed. Two lots of mill screenings, which contained from 25 to 47 per cent weed seed, were ground and the samples examined for weed seeds. In 100 gm. of screenings thus ground only 1 weed seed was found capable of germination. A report is given on the number of seeds produced by different species of weeds and the effect of the use of unclean seed or grain on the distribution of weeds. The viability of different varieties of weed seeds is commented upon, and notes are given on the chemical composition of 18 weeds which were subjected to analysis.

Experiments were conducted on the use of barnyard manure as a source of weed distribution, and it was found that a considerable number of weed seeds go over in the solid feces in a viable condition.

A discussion is given on different methods of combating weeds, and in the opinion of the author no single treatment will suffice to destroy weeds completely, but the work must be continued from year to year with the means at hand.—F. W. WOLL.

An injurious weed, C. FRENCH (*Jour. Dept. Agr. Victoria, 2 (1903), No. 1, pp. 65–67*).—A description is given of St. John's Wort (*Hypericum perforatum*), which has become a serious pest in parts of Australia. Various suggestions are given for its eradication and estimates of the probable cost.

Some introduced species of dodder in Germany, W. KINZEL (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 5. pp. 177–180*).—Notes are given on a number of species of Cuscuta which have been recently introduced into Germany in clover and other seeds. Among those mentioned are *C. planiflora*, *C. racemosa*, *C. lupuliformis*, *C. gronovii*, etc.

Concerning the germination of dodder seed, W. KINZEL (*Naturw. Ztschr. Land- u. Forstw., 1 (1903), No. 3, pp. 104–110*).—The results of the study of the germination of a number of species of Cuscuta are given.

DISEASES OF PLANTS.

The Granville tobacco wilt, F. L. STEVENS and W. G. SACKETT (*North Carolina Sta. Bul. 188, pp. 79–96, figs. 15*).—A preliminary account is given of a very destructive disease of tobacco which has made its appearance in Granville County, N. C. Inasmuch as there may be other wilt diseases found to affect tobacco plants, the authors purpose distinguishing this particular form under the name of the Granville wilt, and have stated that a preliminary description of the disease was given in a press bulletin issued by the station August 22.

The first indication of the disease is seen in the drooping of the leaves, which become soft and flabby as though suffering from want of water. The wilted leaves soon die and finally the whole stalk is destroyed. At the early stages of the disease a cross section of the stem shows a yellowish discoloration of the woody portion. In more advanced stages the wood is found to be filled with black streaks, and these become so abundant in the later stages that the woody tissue is almost entirely discolored.

The root seems to be the seat of the original infection, and any plant sufficiently advanced with the disease to show symptoms in its foliage will have its roots in an advanced stage of decay. The disease is most conspicuous in the largest roots, but the smallest fibers on close examination are similarly affected. When all the roots of the plant are diseased the death of the plant naturally follows very quickly, and in such cases the progress of the disease in the stem is cut off by the death of the plant. If only one root be affected, the disease in the stem will be on the side nearest the affected root. The spread of the disease is much more rapid in a longitudinal than in a transverse direction.

There are said to be a number of diseases of tobacco which are recognized by tobacco growers, but the Granville wilt may be readily distinguished by the diseased roots and the black streaks in the wood. Corroborative evidence is at hand which seems to show that the disease increases in severity year by year after the first infection in a field. It is further noticed that soil once seriously affected may recover to some extent if tobacco should not be raised on the ground for a number of years. The disease may be carried from an affected field to one lying below it by the flood water which has been contaminated on the upper field. In the region covered by this report tobacco is the chief money crop, and as some fields are almost entirely destroyed, the loss is very great.

The history of the observation of the disease and its distribution are briefly outlined, and a number of factors are suggested as to its probable cause. As a result of a careful examination, the authors have found the blackened portions of the root, stem, and leaves to be filled with bacteria. They are never present in healthy parts of the plant, but being so abundant in the diseased portions it is strongly believed that these germs cause the Granville wilt. This hypothesis can not be definitely

established, however, until the disease has been artificially produced by the inoculation of healthy plants. Various methods of carrying on investigations are suggested, and notes given as to the length of time which the organisms are able to survive in the soil.

As means of preventing loss, the authors suggest the destruction of the diseased plants, great care in preventing infection through soil carried on implements or the feet of animals from infected to other fields, crop rotation, and the planting of resistant varieties of tobacco.

The wilt disease of tobacco and its control, R. E. B. McKenney (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 1, pp. 6, fig. 1*).—A description is given of the wilt disease of tobacco, which has been under observation for some time in North Carolina. The disease makes its appearance when the tobacco plants have attained about one-third of their growth, and the first evidence of the disease is the sudden wilting or drooping of one or more of the leaves. This is followed by the wilting of other leaves, and later the stem blackens and rots, the plant being destroyed.

The cause of this disease is said to be similar to that which causes the wilt of cotton, watermelon, and cowpea and, as shown by comparison with these diseases, the Fusarium to which the disease is attributed, gains entrance to the plant through the fine roots. It is a soil fungus, and for its eradication all diseased plants should be collected and burned. Tobacco and other susceptible crops should be cultivated in long periods of rotation, and as an additional means of getting rid of the fungus in the soil the author recommends autumn plowing and burning of the stubble. Breeding resistant varieties is thought to possibly be of value and experiments along this line are under way. As an additional precaution it is recommended that no fertilizers containing kainit or muriate of potash be used. Observations and experiments on this disease are being continued, and it is hoped that some definite method of control may be discovered in the near future.

The mosaic disease of Sumatra tobacco. I, Report of experiments conducted at Deli during 1901–2 on the mosaic disease, F. W. T. Hunger (*Meded. 'S Lands Plantentuin, 1903, No. 63, pt. 1, pp. 103*).—The report is given in 3 chapters, covering the field work, the laboratory work, and the discussion of remedies and preventives, respectively.

The field experiments were designed to show whether various methods of treating the seedlings and mature plants did or did not influence the occurrence of the disease. A number of seedlings were transplanted 1, 2, or 3 times before being finally planted in the field, but it was found that this had no effect upon the occurrence of the disease. Seedlings that were pulled while the soil was dry and transplanted were afterwards more seriously affected than seedlings that were pulled out of wet soil.

At different ages plants were topped to determine the effect of this operation upon young and older plants. It was shown that of plants topped at 3 weeks of age the percentage of diseased plants was less than when the plants were topped at 6 weeks of age. But it also developed that out of 1,200 plants on new ground not one developed the disease, though they were topped at ages varying from 2 to 6 weeks.

Cuttings from healthy and from diseased plants were rooted. Those from the diseased plants did not flourish and all developed the disease, but while those from the healthy plants grew well every plant subsequently became diseased. When scions from diseased plants were grafted upon healthy stems the old leaves on the healthy stems did not become diseased, but all the new growth on the old stems was diseased. Scions from healthy plants grafted upon diseased stems developed the disease immediately after the union was formed.

Tests were made to determine the effect of fertilizers, potassium nitrate and ammonium sulphate being tried. These were applied at the time of seeding and also at the time of transplanting, but no marked effect could be noticed. Observations made to

determine whether diseased plants became centers for the further spread of the disease showed that they did not.

An effort was made to determine whether weather conditions were influential in connection with the occurrence of the disease. The results were not conclusive, but it is pointed out that more diseased plants were found after a heavy rainfall and a day of high temperature than at other times.

While the author recognizes the fact that the disease can be caused by the injection of sap from diseased plants into healthy ones, he denies that the disease can be communicated by the external application of the diseased sap, provided care is taken that the diseased sap does not run down the stem and get into the soil among the roots.

To determine whether the seed used influenced the presence of the disease, seeds were selected from healthy and from diseased plants, but no marked difference was observed in the results. In a test with small, large, and medium-sized seeds it was found that the medium-sized seeds produced the smallest percentages of diseased plants, while the number of diseased plants from the large and small seeds was about equal.

In regard to the cause of this disease the author, while admitting that it is physiological, contends that it is not due to the retarding effect of oxydase and peroxydase on diastatic ferments. He has previously maintained that the apparent excess of oxidizing enzyms in the diseased leaf was really due to the smaller amount of sugar, tannin, and organic acids contained in these leaves, as compared with that contained in healthy leaves, and in the present paper he states that these enzyms do not retard the conversion of starch into sugar. Ten cc. of a solution giving a strong reaction with guaiac were added to 25 cc. of potato starch in 1 per cent solution, and 20 mg. pure diastase and an equal amount of the same oxydase solution, after being heated at 110° for half an hour, was added to a like amount of starch and diastase. The heated solution gave no reaction with guaiac. The conversion of the starch into sugar proceeded with the same rapidity in both cases, the active oxydase in the one solution having no retarding effect.

Believing that the retarding effect observed by some authors was due to the presence of tannic acid, the author prepared a solution of this acid from the alcoholic extract of tobacco leaves and added this to the oxydase solution. In one case this was heated so as to precipitate the tannic acid and thus render it inactive. The results showed that in the solution containing the unheated tannic acid the conversion of the starch proceeded much more slowly than in the other solution, thus confirming his opinion. He also maintains that oxidizing enzyms will not diffuse and hence can not be taken up by the roots of plants.

The author is unable to throw light on the nature of the disease. In general he attributes it to the inability of the thin-leaved Deli tobacco to withstand unfavorable external influences, or, in other words, to the constitutional weakness of a close-bred strain, by reason of which the physiological processes are disturbed by unfavorable surroundings. He admits, however, that he is unable to explain the phenomenon of infection, and that his explanation of the disease is incomplete. The remedy suggested is to breed resistant plants.—H. M. PIETERS.

Fungus diseases of cotton, L. LEWTON-BRAIN (*West Indian Bul., 4 (1903), No. 3, pp. 255–267, figs. 3*).—Descriptions are given of a number of fungus diseases of cotton, the information being largely drawn from publications of this Department, the Alabama Station, etc.

A fruiting stage of Rhizoctonia solani, F. M. ROLFS (*Science, n. ser., 18 (1903), No. 466, p. 729*).—While studying the Rhizoctonia of the potato, the author became convinced that the fungus is not a sterile one, as has been frequently claimed, and much time has been given to a study of the fruiting stage.

Observations show that potato plants developed from tubers which are more or less covered with sclerotia of this fungus usually have their subterranean parts covered with a dark-brown cobweb-like mycelium. This covering frequently extends up the green stems 1 to 3 in., or more, above the ground, forming a thin layer of a greenish-white color. This layer does not adhere firmly to the stem and cracks easily when it becomes dry; consequently it disappears soon after the death of the plant. The tip of the outermost branches of this layer produced spores. Thus far pure cultures of the fungus have not been directly obtained from the spores, but cultures made from the hymenial layer invariably produce a luxuriant growth of Rhizoctonia.

The character of the fungus agrees on the one hand with *Corticium vagum*, and on the other hand with *Hypnochus solani*, and it is thought that probably these 2 species may eventually prove to be the same.

The formalin treatment for wheat and oat smut, R. K. BEATTIE (*Washington Sta. Bul. 54, pp. 8*).—The author estimates the losses in 1902 to the oat and wheat harvest, in Washington, due to smut, at $2,500,000. Notes are given on various individual losses, followed by a brief popular description of the smuts attacking the cereals.

Soaking the seed grain for a few minutes in copper-sulphate solutions is quite extensively followed, but the investigations of the author show that the treatment is not sufficiently prolonged. Instead of dipping the grain and allowing it to remain in the solution from 5 to 20 minutes, as is the common practice, the author suggests that the soaking should be for at least 12 hours. A better treatment, however, is recommended in the substitution of formalin solution for the copper-sulphate solution. The method of treatment is described in detail.

"Takeall" and "whiteheads" in wheat crops, W. L. SUMMERS (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 5, pp. 297–299*).—Notes are given on the disease of wheat which has been determined to be caused by the fungus *Ophiobolus graminis*. This fungus has been the cause of considerable loss in various parts of the country, and while in Europe it is said that the use of phosphates has been beneficial in reducing the amount of disease, their use in Australia has not been followed with a reduction of loss. The greatest benefit has been found by burning over the stubble fields prior to plowing.

Uredinous infection experiments in 1903, W. A. KELLERMAN (*Jour. Mycol., 9 (1903), No. 68, pp. 225–238*).—In continuation of experiments reported for 1902 (E. S. R., 14, p. 530), the author has carried on experiments with various species of rusts during 1903, 22 species being used and 9 successful inoculations secured. As in the former investigations, very early inoculations have proved advantageous in this kind of investigation.

The occurrence of Puccinia phragmitis in Nebraska, J. M. BATES (*Jour. Mycol., 9 (1903), No. 68, pp. 219, 220*).—The author reports having found æcidia, which proved to be *Puccinia phragmitis* on rhubarb in Nebraska, which appears to be a new host for this country. By subsequent investigations a number of species of Rumex were found affected in a similar way.

Letters on the diseases of plants, N. A. COBB (*Agr. Gaz. New South Wales, 14 (1903), No. 10, pp. 955–986, figs. 31*).—The author discusses apple canker, peach curl, various diseases of citrus fruits, diseases of passion vines and walnuts, leaf curl of the potato, and various root rots and timber rots. So far as known remedies are given for these different pests.

A method for rendering cucumber and tomato plants immune against fungus parasites, G. MASSEE (*Jour. Roy. Hort. Soc. [London], 28 (1903), No. 1-2, pp. 142–145*).—Cucumbers and tomatoes grown under glass are highly susceptible to disease, the principal reasons for which are the soft foliage and the presence of fungi

and nematodes in the soil. The author briefly describes a number of the more common diseases to which these plants are subject, and gives an account of experiments conducted with the object of ascertaining whether substances taken up by the roots of the plants would not render them immune to the attacks of fungus parasites. Among the various substances tested copper sulphate alone proved adapted to the conditions of the experiment.

Cucumber and tomato seed were sown, and the plants grown in the house having a mean temperature of 75° F. Three hundred seedlings of each kind were subjected to the experiment, 50 of each being used as check plants. When the seedlings were about 2 weeks old the cucumbers were grouped around a number of large cucumber plants badly attacked with disease, and tomato seedlings in a similar way about diseased tomato plants. At this period the treatment consisted of watering the plants every third day with a solution containing 1 part of copper sulphate in 7,000 parts of water. The check plants, which were not watered with the copper solution, were indiscriminately mixed with the treated plants.

After a month's treatment all the tomato plants were perfectly free from disease, while one or both cotyledons of 34 of the cucumber plants showed symptoms of disease. At the same time a considerable number of the untreated plants of both kinds were affected. At this stage both treated and check plants were sprayed with water containing spores, causing their respective diseases and under this treatment all the check plants became badly diseased within 2 weeks. After 6 weeks' treatment with solution of copper sulphate of the strength above indicated the solution was increased to 1 part of copper sulphate and 6,000 parts of water and the soil about the plants soaked every fourth day until the end of the experiment, which lasted for 11 weeks. At this time both cucumber and tomato plants were bearing good crops of well-matured fruit. Not a single tomato plant treated with copper-sulphate solution showed a trace of disease and in the case of the cucumber plants the disease never progressed beyond the cotyledons, as noted above. An examination was made of the fruits of both tomato and cucumber and only slight traces of copper sulphate were present.

The author calls particular attention to the fact that so far as his experiments have been conducted the above method of treatment secures immunity against fungus parasites when applied to cucumbers and tomatoes only. Upon other plants markedly different effects were observed. *Luffa ægyptiaca*, a plant closely allied to the cucumber, was killed by 2 waterings of a solution of 1 part copper sulphate and 6,000 parts of water. On the other hand, barley remained perfectly healthy when treated with a solution of 1 part in 500, and in addition became badly affected by the grass mildew, *Erysiphe graminis*. As a proof that the solution of copper sulphate is absorbed by the plants, the author quotes experiments with garden nasturtium, where the effect of too strong a solution was shown by the bleaching of the tissues surrounding the water stomata. Grasses similarly treated showed a like bleaching of the tips of the leaves.

Danger arising from the presence of fungi or nematodes in the soil may be guarded against by sterilizing the soil with gas lime.

Tomato leaf spot, D. McAlpine (*Jour. Dept. Agr. Victoria, 2 (1903), No. 1, pp. 70, 71, pl. 1*).—A description is given of the tomato leaf spot due to attacks of *Septoria lycopersici*. This disease has become quite prevalent in parts of Australia, occasioning considerable loss. Its effect as produced upon the host plant is described, and based on suggestions given in Alabama Bulletin No. 108 (E. S. R., 12, p. 569), spraying with Bordeaux mixture is recommended for its prevention.

An apricot blight, W. Paddock (*Colorado Sta. Bul. 84, pp. 14, pls. 2, figs. 2*).—The author's attention was called to a disease of apricots in the fall of 1902, the injury greatly resembling that caused by the common pear blight. A careful examination of the diseased tissues and inoculation experiments showed that the apricot blight

is of bacterial origin and due to the same organism as that causing the fire blight of pears. The detailed results of his experiments are given. As preventive treatment the author suggests the pruning of the diseased portions of the trees and attention given to prevent infection being carried from one tree to another.

Collar rot of citrus trees (*Jour. Jamaica Agr. Soc., 7 (1903), No. 11, pp. 435–438*).—A description is given of a disease of citrus trees attributed to *Fusisporium limoni*. This disease may be recognized by an exudation of gum at the collar of the plant, the decay of the bark in patches, and the subsequent disagreeable odor, as well as by the unhealthy appearance of the foliage and the death of the small shoots. The effect of imperfect drainage, close planting, improper propagation, etc., as contributing to this disease are described, and various methods of prevention are given. Based upon experiments which have been conducted in Florida, the author recommends washing the trees with solutions of sulphurous acid, carbolic acid, or a sulphur wash, a formula for which is given.

Canker in cacao (*Jour. Jamaica Agr. Soc., 7 (1903), No. 11, pp. 450, 451*).—Based upon successful practice in Ceylon, rules are given for the prevention of canker in cacao, which include the thinning of shade so that sun and air can reach all parts of the trees, the destruction of all diseased parts, and careful attention to the subsequent development of the trees.

Pests of orchard and fruit garden, M. C. COOKE (*Jour. Roy. Hort. Soc. [London], 28 (1903), No. 1–2, pp. 1–44, pls. 3, figs. 10*).—Descriptive notes are given of a large number of diseases of orchard and garden fruits and, so far as known, methods of treatment are suggested.

Root diseases of fruit and other trees caused by toadstools, C. V. PIPER and S. W. FLETCHER (*Washington Sta. Bul. 59, pp. 14, figs. 5*).—According to the authors, the prune growers of Washington have suffered severe loss by the death of their trees, and an examination showed that the injury was quite similar to that observed in young orchards after a hard winter. The trees bore the appearance of having been frozen, the inner bark being killed at the collar of the plant. An examination of specimens showed, however, that the trees were infested with rhizomorphic strands of a fungus, which was later determined to be *Armillaria mellea*. The effect of this fungus on the tree as shown by the appearance of the leaves, roots, and trunks is described. A careful examination of the diseased trees shows the presence of the black strands just beneath the ground, and later the fruiting stage or the mushrooms appear.

The extent of injury due to this fungus is indicated in statements made regarding the losses in a number of orchards, nearly one-half the trees in one orchard having died within the last few years. A brief description is given of the fungus and its distribution. With a single exception, it has only been observed to attack prune trees. As the disease has not a wide distribution, the authors suggest the pruning of all diseased trees and care in subsequent planting. The trees should be kept in a healthy, vigorous growth by good culture, and under no circumstances should the mushroom form be allowed to be produced on the trees, as it is through these that the wide distribution of the disease takes place.

A second form of root disease is described, which is attributed to another form of *Armillaria mellea* which attacks wild cherry, crab apple, maple, and fir trees. This fungus differs from the previous one in the bulbous enlargement of the base of the fruiting form. The injury caused by this rot is not as severe as that previously described, and at present no serious loss is anticipated from this source. A technical description of the fungus is given.

A leaf-curl disease of oaks, E. M. WILCOX (*Alabama College Sta. Bul. 126, pp. 171–187, pl. 1, figs. 3*).—This bulletin is designed to call attention to one of the fungus diseases of oak trees that threatens to destroy many of these trees, particularly in cities and towns. The disease makes its appearance early in the spring before the

new leaves are mature. At this time gray or bluish spots appear on the leaf, and by the rapid growth of the leaf at these points the surface becomes convex on one side and concave on the other. In some of the narrow-leaved species of oaks the spots become confluent over a large portion of the leaf, so that it is as badly curled as in the case of the peach-leaf curl, which is due to a closely related parasite. By the rapid spread of the disease from leaf to leaf partial or complete defoliation of the tree may occur early in summer. This defoliation has a weakening effect upon the tree and a cumulative effect may result in the final destruction of the tree.

The fungus causing the disease has been determined as *Taphria cærulescens*, a description of which is given. The fungus is not perennial within the tissues of the host plant, and experiments with Bordeaux mixture have shown that it can be successfully combated by 3 or 4 sprayings of that fungicide. The applications should be begun early in the season and continued until the leaves have attained their mature size. A list is given of 10 species of oaks which are known to have been infected by this fungus, and the distribution of the parasite throughout the State of Alabama and the United States is indicated. A bibliography of the more important articles relating to the disease concludes the bulletin.

Dead horse-chestnut trees, M. C. Cooke (*Jour. Roy. Hort. Soc.* [*London*], *2*[illegible] (*1903*), *No. 1–2, p. XXII*).—A brief report is given of the destruction of horse-chestnut trees, which is believed to be due to *Stereum purpureum*, although it does not appear that this species has been hitherto recognized as causing the destruction of forest trees. A related species, *S. hirsutum*, which is common as a saprophyte, is also known to become parasitic and it is thought probable that the species in question has the same faculty.

ENTOMOLOGY.

The enemies of agriculture, A. L. Herrera (*Las plagas de la agricultura. Mexico: Ministerio de Fomento, 1903, pp. 435–626, pls. 9, figs. 18*).—This is a continuation of the author's general work on the subject of insect pests and fungus diseases (E. S. R., 14, p. 467). Notes are presented on the insect pests of beans, peas, and other legumes, and on insects injurious to corn, apples, citrus fruits, olives, pear, pine, and other forest trees, and cultivated plants. A discussion is also presented on mosquitoes, grasshoppers, the use of parasitic fungi in the destruction of insects, and San José scale.

Entomology and agricultural parasitology, G. Guénaux (*Entomologie et parasitologie agricoles. Paris: J. B. Baillière & Sons, 1904, pp. XII+588, figs. 390*).—This volume constitutes one of a general series entitled Agricultural Encyclopedia, and edited by G. Wery. The subject-matter includes a description of the various forms of lower animals which are injurious to crops and domesticated animals. The pests discussed in the volume include protozoa, worms, mollusks, myriapods, arachnids, and insects. The injurious insects are classified according to their systematic position and also according to the crops, animals, or products which they attack. Chapters are also presented on beneficial insects and on remedies for controlling injurious species.

Report of the chief inspector of nurseries and orchards, A. F. Burgess (*Columbus: Ohio State Bd. Agr., 1902, pp. 34, figs. 8*).—Brief notes on the inspection work of the Ohio State Board of Agriculture during the year 1902, with statistical data concerning the number of trees and amount of nursery stock inspected and the remedies recommended. Brief notes are also given on peach yellows, black knot, cankerworm, gypsy moth, and San José scale. A copy is given of the nursery and orchard inspection law of Ohio, together with a list of nurserymen of the State, and an appendix in which remedies for various fungus and insect pests are described.

Insects injurious and beneficial, E. P. Venables (*Rpt. Supt. Farmers' Insts. British Columbia, 4* (*1902*), *pp. 45–48*).—During the season of 1902 plant lice, espe-

cially the apple plant louse, were unusually abundant, but they were somewhat reduced during the latter part of the season by the presence of parasites. Plant lice also occurred in large numbers on hops and other cultivated plants. Notes are presented on San José scale, cutworms, grasshoppers, wireworms, etc.

Report of the entomologist, W. W. Froggatt (*Agr. Gaz. New South Wales, 14 (1903), No. 9, pp. 797–803, pl. 1*).—A short account of the operations of the entomologist during the past year. Brief mention is made of the Hessian fly, codling moth, woolly aphis, fowl tick, botfly, various scale insects, locusts, bumble bees, and other species.

Insectarium notes and insects found about the Hawkesbury College, W. W. Froggatt (*Agr. Gaz. New South Wales, 14 (1903), No. 10, pp. 1019–1027, pls. 2, fig. 1*).—Economic and biological notes are presented on *Protoparce convolvuli, Earias fabia, Teia anartoides, Ocinara lewinæ, Gelechia simplicella* on soy beans, *Pentadon australis, Aleurodes vaporariorum, Heliothrips hæmorrhoidalis,* etc.

Report of the inspectors under Vegetation Diseases Act, J. Martin, Jr., et al. (*Agr. Gaz. New South Wales, 14 (1903), No. 9, pp. 870–875*).—Statistics are presented on the quantities of fruit, nursery stock, etc., reported at various points and inspected by various officials. The greater part of this material was fumigated with hydrocyanic-acid gas, and in this connection notes are presented on the extent of infestation of fruits and trees with San José scale.

Fruit and plant inspection, G. Quinn (*Rpt. Min. Agr. South Australia, 1903, pp. 23–26*).—A report is presented on the progress of orchard and garden inspection in various parts of South Australia and on the inspection of imported fruit and nursery stock. Particular attention is devoted to a discussion of the codling moth and *Aspidiotus coccineus.*

Report of the entomologist and vegetable pathologist, H. Tryon (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 460–466*).—Brief notes are given on a large number of injurious insects and fungus diseases which prevailed during the year. The author also calls attention to the collections and educational work of his department.

Injurious insects and other animals observed in Ireland during the year 1902, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc., 1 (1903), IV, No. 9, pp. 195–218, pls. 2, figs. 7*).—*Hepialus humuli* is reported as injurious to oats and potatoes. The use of gas lime and deep plowing are recommended in the control of this insect. Notes are also given on crane flies, wheat-bulb fly, carrot fly, *Pegomyia betæ, Enchytræus parvulus,* rose sawfly, wood lice, *Syagrius intrudens* on ferns, *Cryptococcus fagi* on beets, Mediterranean flour moth, *Anobium paniceum, A. domesticum,* and *Tyroglyphus longior.*

Insects injurious to fruits and garden vegetables, J. Wortmann (*Ber. K. Lehranst. Wein, Obst- u. Gartenbau, Geisenheim, 1902, pp. 203–215, figs. 6*).—Economic and biological notes on *Ramphus flavicornis* and nematode worms in fig leaves. Brief notes are also given on beneficial insects and on a method of controlling *Tortrix ambiguella.* Since the pupæ of this insect pass the winter in various sheltered locations it was found necessary to destroy them on the stakes used in vineyards. For this purpose the stakes were temporarily removed, tied in bundles, and dipped in boiling water for a period of 3 to 5 minutes. Good results were obtained by this treatment.

British Tyroglyphidæ, A. D. Michael (*London: Ray Society, 1903, vol. 2, pp. VII + 183, pls. 20*).—This volume completes the author's monograph on this family of mites. A detailed index is presented covering the matter in both volumes, together with a bibliography of literature relating to the subject and a list of foreign species of Tyroglyphidæ. Descriptions are given of species belonging to various genera, including Chortoglyphus, Fusacarus, Trichotarsus, Hericia, Tyroglyphus, etc.

A monograph of the Cynipidæ of Europe and Algeria, J. J. Kieffer (*Monographie des Cynipides d'Europe et d'Algérie. Paris: A. Hermann, 1903, vol. 2, No. 1,*

pp. 288, pls. 9). In this part of the author's monograph of the Cynipidæ the following subfamilies are discussed: Allotriinæ, Eucoelinæ, and Figitinæ.

The larvæ of Trichoptera, R. STRUCK (*Mitt. Geogr. Gesell. Naturhist. Mus. Lübeck, 2. ser., 1903, No. 17, pp. 43–124, pls. 7*).—A detailed description of the more important anatomical features, habits, and life history of various species of this group.

Observations on wasps, C. JANET (*Observations sur les guêpes. Paris: C. Naud, 1903, pp. 85, figs. 30*).—A discussion is presented on the anatomical details, feeding habits, life history, parasites, and construction of the nests of *Vespa crabro*, *V. media*, *V. silvestris*, *V. saxonica*, *V. rufa*, and other species of this genus and also of Polistes.

Biology of the genus Chermes with special reference to C. piceæ, O. NÜSSLIN (*Verhandl. Naturw. Ver. Karlsruhe, 16 (1902–3), pp. 3–20*).—As a result of the study of *Chermes piceæ* and other species of this genus the author comes to the conclusion that *C. piceæ* is reproduced parthenogenically and that the disadvantages of this form of reproduction are partly overcome by the existence of a long-lived larval form.

How to combat the Mexican cotton-boll weevil in summer and fall, E. D. SANDERSON (*Texas Sta. Circ. 4, pp. 4*).—The remedies for this insect, as mentioned by the author, consist in growing an early maturing cotton, and in destroying the beetles by grazing the cotton with cattle and pulling and burning stalks which are unused. It is also recommended that the land be plowed deeply in late fall or early winter.

Insects attacking cotton in the West Indies, H. A. BALLOU (*West Indian Bul., 4 (1903), No. 3, pp. 268–286, figs. 4*).—Economic and biological notes are presented on cotton worm, bollworm, Mexican cotton-boll weevil, cotton-plant louse, scale insects, cutworms, grasshoppers, *Dysdercus andreæ*, *D. annulliger*, species of Phytoptus, etc.

Some insects attacking the stems of growing wheat, rye, barley, and oats, with methods of prevention and suppression, F. M. WEBSTER (*U. S. Dept. Agr., Division of Entomology Bul. 42, pp. 62, figs. 15*).—The chief purpose of this bulletin is to present descriptions and notes on the habits and life history of a number of small insects of cereal crops. The injury due to these insects has frequently been mistaken for the attacks of the Hessian fly. The species specially considered in the bulletin are *Isosoma grande*, *I. tritici*, *I. hordei*, *I. captivum*, *I. websteri*, *I. hirtifrons*, *I. secale*, *I. fitchii*, *Meromyza americana*, *Oscinis carbonaria*, and *O. soror*.

In connection with a discussion of each one of these species various suggestions are made regarding cultural methods which will materially assist in controlling the pests. According to the author's observations it may be stated as a general rule that the same remedies which tend to hold the Hessian fly in check are effective against other small cereal insects. The cultural remedies most confidently recommended include the destruction of grass and other plants on which these pests may live in the neighborhood of grain fields, rotation of crops, burning of stubble, and late seeding.

A brief account of the principal insect enemies of the sugar beet, F. H. CHITTENDEN (*U. S. Dept. Agr., Division of Entomology Bul. 43, pp. 71, figs. 65*).—This material has already been abstracted from another source (E. S. R., 15, p. 379).

Catalogue of the Museum of the Experiment Station for Sugar Cane in West Java, W. VAN DEVENTER (*Proefstat. Suikerriet West Java, Bul. 6, 1903, pp. 46, pl. 1*).—A list is presented of the varieties of sugar cane in the museum and of the species of insects and other injurious animals and fungus diseases which occur on sugar cane. The different species of insects and fungus pests are briefly described and recommendations are given regarding the best methods for combating them.

The sugar-cane borer (Chilo simplex), E. P. STEBBING (*Indian Mus. Circ. Agr. Econ. Ent., No. 3, pp. 6, figs. 2*).—This insect may be controlled by cutting out and destroying infested canes and burning or burying all discarded tops and refuse after the crop has been cut over.

The Bengal rice hispa (Hispa ænescens), E. P. Stebbing (*Indian Mus. Circ. Agr. Econ. Ent., No. 2, pp. 4, fig. 1*).—This insect may be controlled in the rice nursery by spraying the young seedlings with Paris green or some other arsenical.

The rice sapper (Leptocorisa acuta), E. P. Stebbing (*Indian Mus. Circ. Agr. Econ. Ent., No. 1, pp. 4, figs. 2*).—Notes are given on the distribution, food plants, and injury caused by this insect. It is preyed upon to some extent by tiger beetles. The remedy recommended by the author consists in the use of a winnowing apparatus smeared with any sticky substance. This apparatus can be brushed over the heads of the rice and will thus remove a large proportion of the insects.

The cutworm (Agrotis ypsilon), E. P. Stebbing (*Indian Mus. Circ. Agr. Econ. Ent., No. 6, pp. 5, fig. 1*).—According to the author's experience this insect may be controlled by the use of poison baits and by direct application of London purple or some other arsenical in a dry form, mixed with lime and ashes.

Observations on the sunflower—its attraction for the fiddler beetle, J. Neish (*Jour. Jamaica Agr. Soc., 7 (1903), No. 8, pp. 321, 322*).—According to the author's observations the fiddler beetle may be readily attracted to sunflowers and may be destroyed on this plant. By sowing sunflower seed around groves of citrus fruits the damage to these fruits may be somewhat checked.

A new jointworm parasite from Russia, W. H. Ashmead (*Canad. Ent., 35 (1903), No. 12, pp. 332, 333*).—*Homoporus vassiliefi* is described as a new species parasitic upon *Isosoma eremitum*.

Seventeen-year locusts in Kentucky, H. Garman (*Kentucky Sta. Bul. 107, pp. 81–100, pls. 4, figs. 3*).—The distribution of the periodical cicada in Kentucky is indicated by counties in connection with a map showing the relative prevalence of this insect. The cicada was found to be especially fond of the black locust for the deposition of its eggs. Notes are given on the injury done by the cicadas and on the time of their appearance and disappearance. The species recognized by the author as occurring in Kentucky are *Cicada pruinosa*, *C. septendecim*, *C. cassinii*, and *C. tibicen*. All these species are described. Notes are given on the life history of the periodical cicada and on the broods which are known to occur in Kentucky. The most important natural enemy of the cicada in Kentucky is *Massospora cicadina*.

The migratory locust (Acridium peregrinum), E. P. Stebbing (*Indian Mus. Circ. Agr. Econ. Ent., No. 5, pp. 9, figs. 5*).—The habits and life history of this species are briefly described. In controlling the insect the author recommends plowing the soil so as to bury the eggs, crushing and burning the young grasshoppers, and the use of extensive smudges.

How to destroy locusts (*Transvaal Agr. Jour., 1 (1903), No. 2, pp. 44–46*).—The methods recommended for the destruction of locusts include the use of screens and pits, locust fungus, and arsenical poisons. The screen and pit system consists of stretching screens made of cheap cloth for any desired distance in a straight line and digging pits at intervals of about 10 yards along the length of the screens. The locusts fall into the pits in searching for a way around the screens, and are prevented from crawling out by zinc bands placed around the opening of the pits. This method is applicable only to the earlier stages before the locusts are able to fly. Locust fungus is said to be effective only when the air is damp. Good results have been obtained in spraying with a mixture of arsenic, soda, and sugar.

Platyparea pœciloptera and its injuries to asparagus, A. Giard (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 24, pp. 907–910*).—The larvæ of this fly mine into the stems of asparagus in longitudinal channels and cause serious damage. The injury produced by this insect has perhaps been in many cases attributed to the attacks of asparagus beetles. The only natural enemy of the insect as observed by the author is a species of myriapod.

Spraying for the San José scale with modifications of the sulphur-salt-lime wash, and chemical notes on this wash, C. V. Piper and R. W. Thatcher

(*Washington Sta. Bul. 56, pp. 31*).—Extensive experiments were made with various modifications of the California and Oregon washes on orchards, including peach, pear, prune, plum, apple, cherry, and apricot trees. During these experiments nearly 20 formulas for these washes were employed, varying in composition from 1 to 1½ lbs. of lime and 2 to 8 gals. of water for each pound of sulphur.

In conversation with orchardists it was found that a great many modifications of the published formulas have been used on a large scale, the purpose of the modifications being to secure more effective formulas. Nearly all formulas, except the most dilute, were quite effective. It was found that after the application of the lime-sulphur wash many of the female insects came out from under the scale, but all of these insects were found to die without reproducing. The criteria relied upon in determining the death of the scale were a change of color from a pale yellow to a dull orange and a shrivelling of the body. A series of laboratory experiments with various insecticides was carried out by R. E. Snodgrass. As a result of all these experiments it is recommended that the formula of the wash be 1 lb. sulphur, 1 lb. lime, and 4 gals. water, and that the salt be omitted.

Potash lye alone was found to be ineffective and injurious to peach trees. The lime-sulphur wash is just as effective when applied cold as hot. Kerosene or crude California distillate petroleum was effective as a summer spray when used in strengths of 10 and 12 per cent. Pear and peach trees were injured by the lime-sulphur wash when this remedy was applied to young leaves. A chemical study of the lime-sulphur wash showed that, after the union of the sulphur and lime products is complete, the excess of lime remains in the form of milk of lime or whitewash.

A monograph of the Coccidæ of the British Isles, R. Newstead (*London: Ray Society, 1903, vol. 2, pp. VIII+270, pls. 42, figs. 7*).—This volume completes the author's monograph on this subject. The first volume has already been noted (E. S. R., 13, p. 968). The number of species of Coccidæ found in the British Isles is 88, together with 4 varieties, and of this number 51 species and 2 varieties have apparently been introduced from foreign countries. The genera treated in this volume include Lecanium, Pulvinaria, Kermes, Dactylopius, Ripersia, Orthezia, etc.

The date-palm beetle (Oryctes rhinoceros), E. P. Stebbing (*Indian Mus. Circ. Agr. Econ. Ent., No. 4, pp. 5, fig. 1*).—This insect appears to have no important natural enemies. The destruction of dead and decaying trees, removal and destruction of rubbish, and the destruction of grubs of beetles which may be found about the roots of trees are recommended for controlling this pest.

The orange weevil, E. S. Panton (*Bul. Dept. Agr. Jamaica, 1 (1903), No. 11, pp. 249–253, figs. 2*).—*Præpodes vittatus* is described in its different stages and notes are given on its habits and life history. This insect does the most of its injury in the larval form. The pest may be controlled by hand picking the beetles, thorough cultivation, and application of lime or sulphate of potash as a dressing around affected trees. Mention is made of *Elis atrata* as a natural enemy of this pest.

Report on the distribution of Phylloxera vastatrix in Austria in 1901, F. Kurmann et al. (*Bericht über die Verbreitung der Reblaus in Österreich im Jahre 1901. Vienna: Dept. Agr., 1902, pp. 356, pl. 1*).—A detailed account is presented by the inspectors in various parts of Austria regarding the prevalence and distribution of Phylloxera, with special reference to the methods which have been employed in controlling the spread of this insect. Copies are given of the laws and regulations of Austria regarding this matter.

Grapevine root worm, E. P. Felt (*New York State Mus. Bul. 72, pp. 55, figs. [illegible]*).—In the present bulletin the author presents the results of observations and experiments made in 1902 and 1903, chiefly in the Chautauqua grape belt. The subjects discussed in the bulletin include an account of the area of infestation, signs of the presence of the insect, injuries due to this insect in Ohio, its early history in this country, a description of the species in its native stages, notes on its life history, an

account of the oviposition of the insect, with notes on the number of eggs laid by different females, habits of the larvæ and pupæ, and experimental work in controlling the pest.

The remedies tested by the author included the destruction of the eggs, pulverizing the soil and mounding, spraying with arsenical poisons, collecting the beetles, destroying the pupæ, spraying with kerosene emulsion or crude petroleum, and applying carbon bisulphid and calcium carbid to larvæ in the soil. As a result of the author's experiments and observations it is concluded that no one method can be depended upon in controlling the pest.

It is recommended that cultural operations be so planned that the earth may be removed from about the base of the vines, or otherwise cultivated at the time when the majority of the insects are in the pupal condition. These cultural operations in conjunction with the collection of the beetles, especially by elaborate beetle-catchers described by the author, and by thorough spraying with some arsenical poison, preferably arsenate of lead, afford a practical solution of the difficulty.

Flea-beetles, R. MARÈS (*Bul. Agr. Algérie et Tunisie, 9* (*1903*), *No. 20, pp. 429, 430*).—Brief notes on the habits and means of combating the common flea-beetles, especially that of the grape.

Notes on Staphylinus olens and Eriocampa adumbrata, H. FAES (*Chron. Agr. Canton Vaud, 16* (*1903*), *No. 21, pp. 599–604, figs. 3*).—*Staphylinus olens* is said to feed to a large extent upon the insect pests of grapevines. Notes are also given on the life history and habits of *Eriocampa adumbrata.* This insect is injurious to various kinds of fruit trees, including the apple, pear, peach, cherry, and plum trees. The larvæ of the insect can be destroyed by applications of lime, tobacco, sulphur, pyrethrum, or soap suds.

Insects affecting forest trees, E. P. FELT (*New York State Forest, Fish and Game Com. Rpt. 1901, pp. 479–534, pls. 16, figs. 26*).—The author discusses the habits, life history, and means of combating a number of forest insects, including *Dendroctonus terebrans, Tomicus calligraphus, T. cacographus, T. pini, T. cælatus,* pine sawyer, ambrosia beetles, white pine weevil, pine-bark chermes, pine-leaf miner, *Polygraphus rufipennis,* etc.

The vertical distribution of forest insects in Switzerland, C. KELLER (*Mitt. Schweiz. Centralanst. Forst. Versuchsw., 8* (*1903*), *No. 1, pp. 3–80, pls. 10*).—The author discusses in detail the gall formations on deciduous and coniferous trees of various species, and presents an account of injury to other parts of these trees by noxious insects and vertebrates. Especial attention is given to the vertical distribution of the species discussed.

The protection of wood and bark against the attack of insects by causing the absorption of their reserve starch, E. MER (*Mém. Soc. Nat. Agr. France, 140* (*1903*), *pp. 233–247*).—In the author's experience not very satisfactory results have been obtained in protecting wood against insects by means of artificial insecticide treatment. Since insects which attack wood and bark feed largely upon the reserve food material in these products, an attempt was made to cause the resorption of the starch by means of special treatment.

It was found that the process of ringing trees at the upper part of the trunk caused the gradual disappearance of the starch at all points below the ring. The starch was transformed into other substances or was used up in the growth of the cambium layer. Wood thus deprived of its reserve starch was found to be well protected against the attacks of species of Anobium and Lyctus. The disappearance of the starch in the trunks of trees may also be brought about by cutting off the branches, or by allowing the whole tree to remain upon the ground several months after felling. According to the author's experience a period of 5 or 6 months is sufficient to bring about the almost total disappearance of the starch.

Spraying with distillates, W. H. VOLCK (*California Sta. Bul. 153, pp. 31,*

figs. 5).—Distillates include all oils derived from crude oil by distillation. They vary considerably in their specific gravity and their physical properties. Emulsions made from California oils have as a rule been less satisfactory than those made from eastern kerosene, and mechanical mixtures are considered much superior to emulsions.

The distillates are considered from the standpoint of their insecticide value and also with regard to the injury caused by them to leaves and fruits. The vegetable tissues are injured by the penetration of oil into the interior of the plant substance, and this penetration varies in extent and rapidity according to the number of stomata and other anatomical structures of the leaves. The chief toxic effects of the oils in the plants are due to diffusion. A drop of oil upon an orange leaf spreads more rapidly and also evaporates more readily than upon an apricot leaf; it therefore causes less injury upon the former than upon the latter. The heavier oils cause more injury than lighter oils, on account of their slow evaporation. Older leaves, on account of their roughness, prevent the drops of oil from spreading and thus become injured to a great extent. Very young leaves may become entirely covered with the film or oil, and thus be killed. The injury from distillates is in the author's opinion not due to any impurities in the oils, but to the oils themselves.

Notes are given on the effects of mixed oils, general and local injury of these oils, methods of application, and the influences of weather conditions, temperature, etc. The more force used in the application of the oils the greater the amount of penetration. A pronounced humidity of the atmosphere has the effect of opening the stomata in the leaves and thus allowing greater penetration of the oil. The injury to plants from oils is due to the prevention of transpiration, exclusion of the air, and to chemical toxic effects. The latter effects are manifested within 60 hours in an atmosphere containing gasoline, by a general bleaching process.

The practical bearing of these investigations is discussed by the author. It appears that many species of insects and mites escape the most careful spraying with distillates; in fact black scale and other insects survive the severest treatment which trees will stand, in sufficient numbers to reinfest the plant within a short time. An extensive reappearance of young scales was noted within from 2 to 3 weeks after spraying. According to the author no applications of distillates can be made without more or less injury to trees and fruit. Both leaves and fruit become spotted and drop. Two applications are all that can be economically applied in 1 year, since experience has shown that if 3 or 4 applications are required, spraying will not be less expensive than fumigation.

Sulphur sprays for red spiders, W. H. VOLCK (*California Sta. Bul. 154, pp. 11, figs. 4*).—This bulletin is occupied with an account of experiments in the destruction of a species of Bryobia on almond and other deciduous trees, and a species of Tetranychus on orange. Mites were inclosed in small cells and subjected to the action of sublimed sulphur. All mites thus treated died within a short time, or if they laid eggs the eggs did not hatch. Mite-infested branches were dusted with sublimed sulphur and inclosed in paper bags without being removed from the tree. The mites were nearly all destroyed within a period of a month.

During these experiments it was found that the use of ground or sublimed sulphur was effective in destroying mites. The trees may be dusted when wet with dew, but results from the use of the dry method are not always satisfactory. Spraying with a finely divided sulphur mixed with water is recommended. In order to cause the sulphur to adhere for as long a period as possible on the leaves experiments were made in mixing flour paste, lime, and other adhesive materials with the spray. The best results were obtained from the admixture of flour paste. Good results were also obtained when adding sulphate of potash to the sulphur spray. During the winter of 1902 about 100 orange trees were sprayed with sulphur and the results were quite satisfactory. The trees and fruit were not injured. Almost equally good results were obtained with sublimed and ground sulphur, but it is recommended that the sulphur should be in a finely divided condition.

The red spider of the almond proved to be much more resistant to insecticides than that of the orange, and sulphid of potash was therefore mixed with the sulphur spray. The majority of the mites were killed by this treatment and the author believes that the foliage can be saved, even in very advanced cases of injury from mites. Contact insecticides proved to be less effective than sulphur. Of the contact sprays, the distillates were most effective. Formulas are given for the preparation of sulphur sprays, with or without sulphid of potash.

Directions for treatment of insect pests and plant diseases, E. D. SANDERSON and E. C. GREEN (*Texas Sta. Circ. 3, folio, figs. 4*).—Brief notes on the important insect and fungus diseases of various cultivated plants.

Insect enemies of books, C. HOULBERT (*Les insectes ennemis des livres. Paris: Alfonse Picard & Sons, 1903, pp. XXXVIII + 269, pls. 3, figs. 59*).—This volume contains a general account of the various insects which injure books and the means for combating them. A summary of the proceedings of a congress for the study of the insect enemies of books held in Paris in August, 1900, is presented by H. Martin. A bibliography of 94 titles relating to this subject is also given.

The insects injurious to books are classified according to their systematic position, and details are presented on the habits and life history of the various species. The orders of insects concerned are Coleoptera, Orthoptera, Thysanura, Pseudoneuroptera, Hymenoptera, and Lepidoptera. Certain species of mites are also regarded as injurious to books. The remedies which have been applied in controlling these insects are classified as mechanical, chemical, physical, and biological. The mechanical remedies include the use of mechanical shock in destroying the insects, and also direct search for insect pests in books, shelves, and cases in libraries; in this group of remedies the author also includes various species of traps, and the use of wood and other materials especially liked by different species of insects and which may be readily removed and destroyed after becoming infested.

The chemical remedies include the use of odorous material, such as camphor, naphthaline, benzine, essence of turpentine, tobacco, and aromatic plants, as well as asphyxiating substances, such as sulphur dioxid, bisulphid of carbon, etc., and toxic substances, such as alum, borax, pyrethrum, quassia, arsenic, and corrosive sublimate. Directions are given for applying these various chemical insecticides. The physical remedies include the use of heat and cold. Cold may be used effectively in getting rid of cockroaches, while many species of insects may be destroyed by subjection to a high temperature, which is harmless for books. Brief notes are also given on the use of fungus and bacterial diseases and animal parasites in the destruction of insect enemies of books.

Attention is called to special methods of construction and management of libraries for the purpose of preventing infestation by insects. In some cases it is recommended that the thread used in sewing books be treated with quassia or tobacco decoction to prevent its being destroyed by insects. *Anobium paniceum* is considered as the most injurious and most widely distributed insect pest of books.

Concerning mosquito migrations, J. B. SMITH (*Science, n. ser., 18 (1903), No. 467, pp. 761–764*).—Several observations are recorded showing that *Culex sollicitans* is a migratory species and wanders long distances from the marshes where the larvæ have lived. This fact, in the author's opinion, must be taken into consideration in adopting measures for the extermination of mosquitoes.

Observations on the characters and habits of Anopheles mosquitoes and their larvæ, S. P. JAMES (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1902, No. 2, pp. 27–58, figs. 21*).—Descriptive notes are given on the anatomy and habits of various species of Anopheles for the purpose of assisting in the differentiation of these species. Special attention is given to the structures which are recognized as possessing value in specific determination. The species of Anopheles found in India are classified and an analytical table is presented to assist in their determination.

Notes are given on the favorite breeding places of the larvæ and on fish and other

animals which assist in the destruction of the larvæ. According to the author' observations the greatest distance to which adult Anopheles fly in India is about three-fourths of a mile.

Variations induced in larval, pupal, and imaginal stages of Bombyx mori by controlled varying food supply, V. L. KELLOGG and R. G. BELL (*Science, n. ser., 18 (1903), No. 467, pp. 741–748*).—The experiments reported in this paper were undertaken for the purpose of determining the relation between the quantity and quality of food and the development and variations in silkworms. The changes in the quality of food were brought about by feeding lettuce in the place of mulberry leaves, while in another series of experiments the quantity of the mulberry leaves fed was made to vary according to desired changes.

These experiments were carried on for a period of 3 years. The characters studied in the silkworms for the purpose of judging of the effect of these varied conditions were the size and weight of the larvæ, the promptness of molting and spinning, fertility and mortality. Silkworms fed on lettuce leaves appeared to adapt themselves quite readily to this diet; the larval skin, however, was thinner usually, and the time consumed in metamorphosis was twice as long as that of larvæ fed on mulberry leaves. In the silkworms fed on mulberry leaves a definite and constant relation was observed between the amount of feed and the size. With regard to the fertility of the eggs it was found that the better nourished the insects the more fertile the eggs.

Experiments in sericulture in Tunis, F. VERRY (*Bul. Dir. Agr. et Com. [Tunis], 8 (1903), No. 29, pp. 501–509*).—The eggs of a number of varieties of silkworms, including the Bagdad and the Yellow Chinese races, were obtained for the purpose of testing their adaptability to the conditions in Tunis. Good results were obtained in the quantity and quality of silk produced.

FOODS—NUTRITION.

Experiments on the metabolism of matter and energy in the human body, W. O. ATWATER and F. G. BENEDICT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 136, pp. 357, pl. 1, figs. 14*).—Continuing previous work (E. S. R., 13, p. 972), the details are reported of 21 experiments, made with the respiration calorimeter, upon the metabolism of matter and energy in the human body. In some of the experiments reported carbohydrates predominated in the diet, and in others fat, while in a smaller number of cases the subjects fasted. In a number of tests the subjects rested, and in others work was performed.

Modifications in the apparatus and experimental methods adopted since the previous report are described, and the results of the present experiments and those previously reported are discussed at length, the subjects including among others the demand of the body for nourishment, the elimination of carbon dioxid, water, and heat; body temperature; heat production *v.* heat elimination; respiratory and carbon dioxid thermal quotients; amounts of energy derived from different nutrients; fats *v.* carbohydrates as protectors of body material and as sources of energy for muscular work; carbohydrates and fats *v.* protein as sources of energy for muscular work; and the efficiency of the body as a machine. The conservation of energy in the body is also spoken of and the experiments with the respiration calorimeter are regarded as a demonstration of the application of this law to the living organism.

The accuracy of the apparatus is shown by the fact that in the check experiments in 1902, when alcohol was burned in the respiration chamber for a period aggregating 380 hours and 44 minutes, the total estimated heat was 34,230 calories and the amount found 34,288 calories, or 100.2 per cent of the theoretical value. The theoretical amount of carbon dioxid produced was 10,984 gm. and the total amount measured was 10,982.3 gm., or 100 per cent. The theoretical amount of water due to combustion of alcohol was 7,974.8 gm., and the amount measured 8,225.9 gm., or

slightly more than the theoretical quantity. These results are in harmony with those obtained in earlier experiments.

In the experiments reported the amount of oxygen consumed was calculated, and the values obtained are used in a discussion of the respiratory quotient. The authors believe that the carbon dioxid thermal quotient also serves as an index of changes taking place in the body. Concerning this quotient they state that, "in comparing the results of these experiments, it was found that the amounts of carbon dioxid and heat produced varied so uniformly that it was believed the ratio of one to the other would afford means of judging of changes which occur in the body. This ratio, which we have called a carbon dioxid thermal quotient, is nearly uniform in experiments with the same conditions of food and work, but changes notably with changes in diet, which accords with the fact that, in the oxidation of the various nutrients of food and the corresponding compounds in the body, the ratio of carbon dioxid to heat is nearly uniform for different compounds of the same class and that the values are sufficiently distinctive to characterize the class.

"From the composition and heats of combustion of the different classes of nutrients the ratios of carbon dioxid to heat produced by oxidation are easily computed. Provided the amount of oxygen were measured, similar ratios could be computed for carbon and heat and oxygen and heat, and would doubtless give useful data. Such ratios might be designated carbon thermal quotient and oxygen thermal quotient."

Concerning the relative merits of fats and carbohydrates as sources of energy for muscular work, the general conclusion drawn from the experiments reported is that "the fats were slightly inferior to isodynamic amounts of carbohydrates as parts of a ration for muscular work. But while the natural inference is that calorie for calorie the carbohydrates were slightly superior to the fats as sources of muscular energy, the difference observed was very small and may have been due to some individual peculiarity of the subject with whom the more directly comparable experiments were made rather than to any inherent difference in the capacity of the materials to yield energy for external muscular work."

The experiments reported also furnish information regarding the different nutrients as sources of energy for muscular work. The conclusions drawn are that a considerable amount of the energy of external muscular work in these experiments must have come from material other than protein, and that "it is in the highest degree probable that the larger part of the material which was broken down and oxidized to supply the energy of external muscular work consisted of carbohydrates and fats.

"These conclusions agree fully with the general belief of physiologists, that all of the nutrients of food, proteids, fats, and carbohydrates may supply energy for muscular work, but that the chief source is in the carbohydrates and fats. They leave no basis whatever for the theory that the proteids are the sole source of muscular energy."

As regards the efficiency of the body as a machine, the results obtained with the different subjects varied somewhat under different experimental conditions. Considering the results of the different experiments the efficiency ranged from 13.3 to 20.2 per cent, and in the latest experiments the average was over 19 per cent in all cases. It appeared that whatever the amount of work which the subject of the experiments did with the muscles used in turning the wheel of the bicycle ergometer, he transformed about 5 calories of energy in his body for every one which was utilized in the performance of mechanical work.

"In all these cases the subjects were fairly efficient machines, as will be seen when it is remembered that the ordinary steam engine transforms only about 15 per cent of the energy of the fuel into work. It is quite possible that something more satisfactory than the ergometer may be devised for utilizing the external muscular work performed by the subject."

Experiments on the digestibility of vegetables, A. P. BRYANT and R. D. MILNER (*Amer. Jour. Physiol., 10 (1903), No. 11, pp. 81–99*).—The digestibility of cabbage, potatoes, beets, green corn, and apple sauce was studied in experiments carried on with healthy young men, each of the articles enumerated being added to a simple basal ration and the digestibility of the foods under consideration calculated from the digestibility of the ration as a whole. The average results which were obtained follow:

Coefficients of digestibility of vegetables.

Kind of vegetable.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.	Energy.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cabbage, average of 3 tests	[a]47.4	[a]40.2	81.6	77.3	55.1	59.5
Potatoes, average of 3 tests	73.1	[b]15.8	99.0	74.3	76.6	93.6
Beets, average of 3 tests	72.4	[b]100.0	96.7	84.4	75.3	89.7
Apple sauce, average of 2 tests	19.1	97.9	99.4	95.2	90.0	98.8
Green corn, 1 test	83.9	41.2	96.6	59.3		86.2

[a] Average of 2 tests only. [b] One test only.

The authors' conclusions follow: "So far as sources of protein or fat are concerned, the vegetables included in these studies may be considered as of little value. They do, however, contain carbohydrates, which the results of these and other experiments indicate to be quite well digested and absorbed; and they may, therefore, be considered as of value as sources of energy, a large proportion of which appears to be available to the body. The chief value of many vegetables, however, is perhaps aside from the nutrients or energy they furnish; they add a pleasing variety and palatability to the diet, supply organic acids and mineral salts, and give the food a bulkiness that seems to be of importance in its mechanical action in maintaining a healthy activity of the alimentary tract. Possibly the result of these conditions is a favorable influence upon the digestion of other food eaten with the vegetable; at least such an effect was suggested by the results of some of these experiments."

In connection with the above experiments the balance of the income and outgo of nitrogen was also determined.

The relative digestibility of some edible fats and oils, J. F. MOORE (*Arkansas Sta. Bul. 78, pp. 33–41*).—The relative digestibility of cotton-seed and other vegetable oils and common culinary fats of animal origin was studied with mice and guinea pigs. In the experiments with mice the fats were mixed with flour and water to a stiff dough which was baked. The guinea pigs were fed wheat bran on which the fat or oil was blown in a fine spray. The following table summarizes the results obtained, the values for mice being the average results of 2 tests and those for guinea pigs the results of 1 test:

Average digestibility of fats and oils. Experiments with mice and guinea pigs.

Kind of oil.	Cooked fat. Experiments with mice.	Raw fat. Experiments with guinea pigs.
	Per cent.	*Per cent.*
Home-rendered lard	96.81	
Home-rendered lard, soft, melting point 27.0° C		88.78
Home-rendered lard, hard, melting point 36.9° C		73.88
Beef suet, melting point 44.9° C		73.66
Refined cotton-seed oil, light	96.19	93.37
Refined cotton-seed oil, heavy		90.47
Olive oil	97.70	88.81
Peanut oil		85.77
Corn oil		86.47
Crude cotton-seed oil	96.97	89.93

"The more fluid oils and soft fats were more completely digested than the heavier oils or the hard fats.

"The effect of an increase in the melting point of a fat on the percentage of digestibility becomes less as the melting point approaches or goes above the temperature of the body. . . .

"It is apparently true, in the cases before us at least, that cooked fats and oils are considerably more digestible than those eaten raw. In cooking a fat there is probably more or less dissociation into glycerine and fatty acids, which, if the theory is correct that the presence of fatty acids is conducive to a more perfect digestion of the fat, will help to explain the higher percentages of digestion in the experiment with the mice. In that work the oils were cooked in the preparation of the food, while in the work with the guinea pigs the oils were fed raw.

"Nothing developed in these experiments to indicate that the vegetable oils used are in any manner inferior to the animal fats as articles of food. In heat producing power the 2 classes are equal, while the vegetable fats appear to have been more completely digested. . . .

"It must be left very largely to the fancy of the individual consumer to decide which class of fats is to be preferred."

Poultry as food, Helen W. Atwater (*U. S. Dept. Agr. Farmers' Bul. 182, pp. 40*).—In this bulletin data regarding the composition and food value of poultry are summarized and discussed. The topics treated of include among others varieties of poultry, fattening poultry and its effect on food value, dressing and marketing, marks of good poultry, cooking, nutritive value of poultry and its cost, and the place of poultry in the diet. The term "poultry," as used, covers chickens, turkeys, guinea fowls, ducks, geese, pigeons, swans, peafowls, pheasants, and quail.

As regards composition the author states that "poultry does not differ as much as is commonly supposed from meat of other domestic animals used for food. Individual kinds and specimens, of course, vary in the relative amounts of protein and fat contained, and there are certain flavors present in poultry which differ from those in other meats. But these differences are so small that they are practically negligible in ordinary diet. Nor is there as much difference in digestibility as is often stated. On the average, poultry is somewhat more easily digested than beef and mutton, but only very slightly. The difference in digestibility between the various kinds of poultry probably depends on the amount of fat contained, the fatter sorts being least easily digested.

"Tenderness of fiber may have something to do with both ease and thoroughness of digestion, and, if so, young birds are more easily digested than old, and the less-used muscles of the chicken, such as the breast, more so than the much-used muscular tissues of the legs. Similarly, white-fleshed birds may be more easily digested than dark-fleshed, because the fibers of their flesh are less closely set; but this is not fully proved. Indeed, very little is positively known on this subject, and that little seems to indicate that the differences in thoroughness of digestion are very slight, and that cooking has much more to do with the digestibility of the birds than these slight differences in composition and texture."

Poultry as food, R. D. Milner (*Connecticut Storrs Sta. Bul. 27, pp. 20, fig. 1*).—On the basis of a large number of analyses of poultry and poultry products which have been made by the station, the food value of poultry is discussed. Statistics are quoted regarding the extent of poultry raising in the United States, and especially in Connecticut; and the importance of this industry to Connecticut and the desirability of increasing it are pointed out.

Alcohol as a food, R. Rosemann (*Arch. Physiol.* [*Pflüger*], *100* (*1903*), *No. 7–8, pp. 348–366*).—The author discusses the nutritive value of alcohol and calls attention to the use of alcohol as a condiment, and related topics.

Standards of purity for food products (*U. S. Dept. Agr., Office of the Secretary, Circ. 10, pp. 13*).—The food definitions and official standards of purity for food products for the United States are given, which were prepared by a committee representing the Association of Official Agricultural Chemists, commissioned by the Secretary of Agriculture in accordance with an act of Congress of March 3, 1903. The committee consisted of W. Frear, E. H. Jenkins, M. A. Scovell, H. A. Weber, and H. W. Wiley. The foods include meat and the principal meat products, milk and its products, sugars and related substances, and condiments.

The standards, the committee state, are based "upon data representing materials produced under American conditions and manufactured by American processes or representing such varieties of foreign articles as are chiefly imported for American use.

"The standards fixed are such that a departure of the articles to which they apply, above the maximum or below the minimum limit prescribed, is evidence that such articles are of inferior or abnormal quality.

"The limits fixed as standard are not necessarily the extremes authentically recorded for the article in question, because such extremes are commonly due to abnormal conditions of production and are usually accompanied by marks of inferiority or abnormality readily perceived by the producer or manufacturer."

The standards adopted for lard and dairy products follow:

"Standard lard and standard leaf lard are lard and leaf lard, respectively, free from rancidity, containing not more than 1 per cent of substances, other than fatty acids not fat, necessarily incorporated therewith in the process of rendering, and standard leaf lard has an iodin number not greater than 60. . . .

"Standard milk is milk containing not less than 12 per cent of total solids and not less than 8.5 per cent of solids-not-fat, nor less than 3.25 per cent of milk fat. . . .

"Buttermilk is the product that remains when butter is removed from milk or cream in the process of churning.

"Pasteurized milk is standard milk that has been heated below boiling, but sufficiently to kill most of the active organisms present and immediately cooled to 50° F. or lower to retard the development of their spores.

"Sterilized milk is standard milk that has been heated at the temperature of boiling water or higher for a length of time sufficient to kill all organisms present.

"Condensed milk is milk from which a considerable portion of water has been evaporated.

"Sweetened condensed milk is milk from which a considerable portion of water has been evaporated and to which sugar (sucrose) has been added."

According to the standards, skim milk shall contain not less than 9.25 per cent of milk solids. Condensed milk and standard sweetened condensed milk are standard sweetened and unsweetened milks condensed until they contain, respectively, not less than 28 per cent milk solids, of which not less than one-fourth shall be milk fat. The standard condensed skim milk is skim milk from which a considerable portion of water has been evaporated.

"Standard milk fat or butter fat has a Reichert-Meissl number not less than 24 and a specific gravity not less than 0.905 (40° C. /40° C.)."

Standard cream is required to contain not less than 18 per cent of milk fat. Evaporated cream is defined as cream from which a considerable portion of water has been evaporated. Standard butter is required to contain not less than 82.5 per cent butter fat. Standard renovated or process butter must contain not less than 16 per cent water and at least 82.5 per cent butter fat. Whole milk or full cream cheese containing in the water-free substance not less than 50 per cent butter fat is designated as the standard.

A standard winter-wheat flour, G. L. TELLER (*Chicago: The Operative Miller Press* [*1903*], *pp. 4*).—Fifteen patent flours from Illinois, Missouri, Indiana, Michigan, and Tennessee were analyzed. They were believed to "represent fairly well the patent flours manufactured from the soft winter wheat in this section of country." A blend of this flour, which is regarded as a standard, and 5 less representative samples, were also analyzed. The values reported are discussed with special reference to the outlining of a scale of comparison.

Preparation of modified milk by precipitating casein with carbon dioxid, S. SZÉKELY (*Arch. Kinderheilk., 36* (*1903*), *No. 1–2, pp. 79–85*).—A method of preparing modified milk approximating mother's milk in composition is described, the principal feature of which consists in precipitating casein with compressed carbon dioxid. According to the author, this precipitation is accomplished without changing the chemical composition of the casein. The precipitate carries with it the calcium united to the casein, and also the tricalcium phosphate suspended in the milk. By the addition of the proper amount of cream and milk sugar a modified milk is obtained which, it is stated, has practically the same composition as mother's milk. When the process of manufacture is completed no carbon dioxid remains in the milk. The gas, as employed, possesses strong germicidal properties, and the resulting product is practically sterile.

Report of the Government Hospital for the Insane (*Washington: Department of the Interior, 1903, pp. 72, pl. 1*).—This report, in addition to statistical and other data, contains an account of a number of dietary studies made during the year 1902-3 by the hospital cooperating with the Department of Agriculture. Of the 27 studies, each of one week's duration, 23 were made with male patients (approximately 1,600 individuals) and 4 with employees (approximately 125 individuals).

"It appeared that on an average the patients consumed food furnishing 93 gm. of protein, 103 gm. of fat, and 361 gm. of carbohydrates per man per day, the fuel value of the diet being 2,705 calories. The food eaten by the employees furnished 125 gm. of protein, 165 gm. of fat, and 466 gm. of carbohydrates, the fuel value being 3,800 calories. . . . It was noted in connection with these investigations that the food purchased was of good quality; that it was stored, handled, and cooked in a cleanly way, and that the service was as good as could be expected under existing conditions."

It was found that the waste, as is perhaps usual at such institutions, was quite high. Suggestions which proved of immediate benefit were made for checking this and for improving the dietary in other ways.

Cookery for the sick and convalescent, C. H. SENN (*London: The Food and Cookery Pub. Agency* [*1903*], *pp. VIII, 38*).—The desirability of preparing foods with great care for the sick and convalescent is briefly discussed and a number of recipes are given.

Diet without salt and its effect upon the body, especially upon the assimilation of food and the metabolism of nitrogen in man, C. M. BELLI (*Ztschr. Biol., 45* (*1903*), *No. 2, pp. 182–222*).—According to the author, in his experiments the consumption of an insufficient amount of sodium chlorid did not modify the digestive functions nor the assimilation of nutrients. The nitrogen metabolism was somewhat affected, being hastened a little when the foods eaten contained no added sodium chlorid. It returned to the normal as soon as the cooked foods contained their usual quantity of added salt. The report includes a bibliography.

Proteid synthesis in the animal body, Y. HENDERSON and A. L. DEAN (*Amer. Jour. Physiol., 9* (*1903*), *No. 6, pp. 386–390*).—In addition to arrowroot and lard, a dog was fed proteid-cleavage products obtained by treating lean beef with concentrated sulphuric acid under the influence of heat, the nitrogenous substances being separated and purified until a biuret reaction was no longer noticeable. The compo-

sition and energy value of the food and the income and outgo of nitrogen were determined.

The authors believe the experiment shows "that the nitrogenous substances in the diet were not immediately and wholly converted into urea and excreted; that they were, on the contrary, to a considerable extent retained; and that portion which was expended (appearing in the urine) exerted a marked proteid-sparing action. These reactions seem to us, however, to afford a sufficient explanation of the facts without invoking the more radical hypothesis of proteid synthesis. The diminution in the nitrogen excretion from 1.9 gm. in the fore period to 0.8 gm. in the after period of fasting suggests that the protoplasmic waste had not been made good, and that the retention of nitrogen is not in itself a proof of proteid synthesis."

New experiments on the physiological action of the proteoses, F. P. UNDERHILL (*Amer. Jour. Physiol., 9 (1903), No. 6, pp. 345–373, pl. 1*).—Experiments with dogs were made to determine the effects of intravenous injections of typical native proteids, proteoses prepared by the digestion of animal proteids with vegetable enzyms, proteoses prepared from proteids and enzyms both of vegetable origin, and proteoses prepared from vegetable proteids by hydrolysis with acids or superheated water. Some tests were also made as to the causes of the toxic effects which have been attributed by other investigators to the injection of proteids. Some of the author's principal conclusions follow:

"There is at present no occasion for attributing the physiological effects following the injection of proteoses into the circulation to the presence of contaminating substances derived from animal tissue or elsewhere. Typical purified vegetable proteids which, when injected are themselves inert in this regard, yield on hydrolysis with acids, or even water alone, proteoses which provoke the characteristic reactions. The proteoses which are formed by the action of proteolytic enzyms of vegetable origin (bromelin, papaïn) on purified proteids, likewise alter *in vivo* the coagulability of the blood and call forth the other well-known symptoms of proteose injections.

"The proteoses occurring in nature in the vegetable kingdom are similarly active, as was to be expected if the toxic properties are a function of these products *per se*. No method of 'purification' has been found which will deprive proteoses of this characteristic physiological behavior in the circulation: when the chemical make-up of the proteoses is profoundly altered and they lose their chemical identity, the typical physiological action may also be lost. . . . Recent studies on immunity have shown equally striking natural differences among animals, and have again emphasized the influence which the mode of introduction of toxins may exert."

Concerning the tryptic digestion of gelatin, T. R. KRÜGER (*Ztschr. Physiol. Chem., 38 (1903), No. 3–4, pp. 320–322*).—A chemical study of the peptone produced by the action of tryptic ferment on gelatin is briefly reported.

On the formation of glycogen from glycoproteids and other proteids, L. B. STOOKEY (*Amer. Jour. Physiol., 9 (1903), No. 3, pp. 138–146*).—The possibility of the formation of glycogen from proteids was studied with hens, the proteids selected being ovomucoid, pancreas nucleoproteid, chondrin, syntonin, casein, sodium casein (alone and with saccharose), and leucin. Some of the author's conclusions follow:

"The outcome of the feeding experiments with those substances which yield carbohydrate cleavage products—ovomucoid, pancreas nucleoproteid, chondrin—scarcely permits any positive conclusion to be drawn. In some of the more satisfactory trials, where the period of feeding was more prolonged and the utilization of the food was apparently better, appreciable quantities of glycogen were found. These do not, however, exceed in amount the maximum glycogen content (0.97 per cent) which has been . . . [previously noted in the liver of the fasting hen]; although, like the writer, most other investigators have noted very small quantities only. . . .

"The feeding of simple proteids—syntonin, casein, and its sodium salts—failed to yield an increase of glycogen in the liver when a single dose was given. But after trials lasting several days, during which considerable quantities of casein were ingested, an accumulation of glycogen too large to be attributed to any residual store in the liver was repeatedly found. . . . It has already been pointed out that negative results in experiments like the present ones do not necessarily indicate the incapacity of the substances fed to promote glycogen formation."

The author discusses the possibilty of leucins being the important intermediate bodies in the formation of sugar and glycogen in the body from carbohydrate-free proteids, and notes that the 2 experiments, which he reports, "do not, at least, speak against the possibility under discussion; nor do they justify any far-reaching statements. The physiologist must look forward to a more profound acquaintance with the chemistry of the proteid molecule before the final word can be spoken."

On the formation of dextrose in metabolism from the end products of a pancreatic digest of meat, P. G. Stiles and G. Lusk (*Amer. Jour. Physiol.*, *9* (*1903*), *No. 6, pp. 380–385*).—Tests are reported in which dogs were given the product obtained by the pancreatic digestion of washed meat. The digestion was continued for 14 months with proper precautions against putrefaction, and the result was described as a dark sirupy fluid, with but little sediment or suspended matter, containing 1.33 per cent nitrogen and giving only a doubtful biuret reaction. "The taste and odor were pronounced but not foul." It was found that 5 gm. of nitrogen fed in the form of these pancreas digestion products, according to the authors, may give rise to the formation of about 12 gm. of dextrose.

"The same amount of nitrogen fed as native proteid would be expected to produce 18 to 19 gm. of sugar. No light is thrown upon the question whether the sugar in our experiments was formed after a proteid synthesis had occurred or more directly from the amido-bodies. Neither have we any evidence as to the relative importance of the several digestive products which were fed. . . . The experiment shows that it is impossible for a large sugar radical to exist in the proteid molecule. The amido nitrogen fed was quantitatively eliminated, and did not protect the body's proteid as do meat and gelatin under similar circumstances."

Salivary digestion in the stomach, W. B. Cannon and H. F. Day (*Amer. Jour. Physiol.*, *9* (*1903*), *No. 6, pp. 396–416*).—Experiments reported on salivary digestion in the stomach were carried on with cats, the authors' earlier investigations having shown that, like the stomach of the dog, rat, rabbit, guinea pig, and man, the stomach of the cat is separated into 2 parts—the quiet cardiac end and the active pyloric end. The animals were fed powdered crackers mixed with a uniform amount of filtered human saliva, and after the expiration of from one-half to 2 hours were etherized, killed, and the stomach contents examined, care being taken to keep the material in the cardiac and pyloric portions separate.

From the results of their experiments the authors believe that the commonly accepted idea that the action of ptyalin is inhibited soon after the ingestion of food is not conclusively proved, and that there is little or no warrant for the commonly accepted accounts of mixing currents in the stomach. Observations show that in many animals, including man, gastric peristalsis occurs only in the pyloric end of the stomach; the cardiac end remains undisturbed by the waves. Food in the pyloric end is soon mixed with the gastric secretions, but food in the cardiac end of the stomach is not mixed with the acid gastric juices for 2 hours or more, and in this region, therefore, during that time salivary digestion may go on undisturbed.

In experiments with cats it appeared "that the percentage of sugar present is about the same in the 2 portions at the end of a half hour, and at the end of an hour the cardiac portion contains about 80 per cent more sugar in unit volumes than the pyloric portion. The actual amount of sugar present in the fundus is relatively

much greater than this ratio would indicate, for the fundus contains after an ordinary meal about five times as much food as the pyloric portion. After an hour the ratio of the sugar percentages in the 2 parts of the stomach begins to approximate unity again. This change is probably due largely to diffusion of sugar from the fundus into the pyloric end, and to some extent to absorption. The diffusion of the sugar does not to a marked degree remove the ptyalin from the food. . . .

"When liquid food is given, when small amounts of food are given, and when the stomach is massaged, sugar percentages in the 2 parts of the stomach are nearly the same.

"Mixing proteid with carbohydrate food protects the ptyalin from the action of free hydrochloric acid in the relatively small pyloric part of the stomach and on the surface of the cardiac contents. The greater mass of the food, lying in the fundus, undergoes uninterrupted amylolysis, not because the proteid protects the ptyalin, but because the food in this region is not mixed with the gastric juice.

"Much of the starch not changed to sugar is changed to dextrin, and thus, since dextrin is not readily fermented, the food is saved to the organism. The especial value of this process lies in the fact that it occurs to the greatest degree in the fundus, in which region the hydrochloric acid, inhibiting the action of many of the organized ferments, does not for some time make its appearance.

"In the early stages of gastric digestion, if food has been properly masticated, the fundus serves chiefly for the action of the ptyalin; the pyloric portion, after a brief stage of salivary digestion, is thereafter the seat of strictly peptic changes. Later, after 2 hours or more, as the contents of the fundus become acid, the food in the stomach as a whole is subjected to the action of proteolytic fermentation."

Oxidations in the animal organism, E. Enriquez and J. A. Sicard (*Les oxydations de l'organisme. Paris: J. B. Baillière & Sons, 1902, pp. 87*).—The nature and function of oxidizing ferments, particularly those found in the animal body are discussed and the author's experiments and those of other investigators are summarized. A bibliography of the subject is appended.

The sugar-forming ferment of the liver, L. Borchardt (*Arch. Physiol. [Pflüger], 100 (1903), No. 5–6, pp. 259–297*).—Experiments, which are reported in detail, led to the conclusion that as regards kind of action and the products formed there is no appreciable difference between the ferment in the blood, which cleaves glycogen, starch, and maltose, and that in the liver. The effects of both alcohol and heat on the 2 ferments are also very similar. The ferment found in the liver is much more active than that found in the blood.

The effect of lecithin on the growth of the white rat, S. Hatai (*Amer. Jour. Physiol., 10 (1903), No. 1, pp. 57–66, fig. 1*).—The effects of lecithin on the amount and character of body growth were studied in experiments with white rats. Those which received the lecithin either by injection or by feeding, according to the author, gained on an average 60 per cent more than those receiving none, the gain being accomplished more rapidly. The central nervous system and the peripheral nerves of the rats fed lecithin were found to be normal. The rats which had been fed lecithin, in the author's opinion, showed the greater power of resistance to unfavorable changes in their surroundings and his experiments are thought by him to confirm those of earlier investigators who claim "the physiological effect of the lecithin to be that of a stimulating agent for normal growth."

ANIMAL PRODUCTION.

Commercial feeding stuffs, H. J. Wheeler, A. W. Bosworth, and J. W. Kellogg (*Rhode Island Sta. Bul. 94, pp. 151–171, figs. 6*).—In compliance with the State feeding-stuff law, 153 samples were collected and examined, including cotton-seed meal; linseed or flax meal; gluten meal and feed; distillers' grains; brewers' grains; wheat bran middlings and mixed feed; corn meal; peanut meal; rice meal; hominy

or chop feeds; proprietary feeds; provenders; beef scraps and bone meal, and condimental feeds. The results obtained are discussed and a number of the feeding stuffs are described.

Condimental feeds, the authors state, "are for the most part made up of ordinary feeding stuffs, and contain drugs in very small quantities. The cost of these feeds ranges from 5 to 50 cts. per pound, and when one considers the fact that the most expensive of any of the drugs usually contained in them can be purchased for less than 10 cts. per pound, it must be obvious that it would be cheaper for the user to purchase the drugs as desired or necessary, and mix them with the ordinary feeding stuffs."

According to the authors, the inspection of feeding stuffs during the past winter has brought to notice "a number of common adulterations. A few of these can be readily detected by the purchaser if he will make a careful examination of the material.

"The usual adulterant of cotton-seed meal is the hull of the seed. This adulterant was formerly easily distinguished by the black appearance, but now the hulls are so finely ground together with waste cotton that they can be recognized only with great difficulty.

"Gluten feed has been sometimes sold as gluten meal. . . .

"Gluten meal is a homogeneous, yellow, granular substance, and its general appearance is quite different from that of the feed.

"In one case dried distillers' grains were being sold as gluten meal. . . .

"Distillers' grains are much darker than gluten feed, and for the reason that gluten feed is made entirely of corn refuse, and the distillers' grains of a mixture of cereals, the two can be distinguished by the barley hulls which are found in the distillers' grains but not in the feed.

"Some of the 'mixed feeds' [which in Rhode Island should consist solely of pure wheat bran and middlings] found upon the market have been found to be grossly adulterated.

"If coarsely ground, the hulls, corncob, etc., used in adulterating 'mixed feed' may usually be detected by taking a small handful of the feed and spreading it in a thin layer upon the palm of the hand. If finely ground, however, the corncob is difficult to distinguish. If hulls are present, they will appear as small, shiny particles, much lighter in color than the brown particles of the bran. In this case care must be taken not to confuse the germ of the wheat with the hull, for the germ is one of the valuable parts of the feed. Its color is nearly like that of the hulls, its high content of fat giving it a glossy appearance. The hulls, however, are hard and not easily broken, but the germs are soft and can be split readily.

"The other feeds which have been adulterated are by-products from starch and hominy manufacture. These are sold under several names, such as chops, hominy, chop feed, hominy feed, and hominy chops.

"These feeds are adulterated with corncob and corn meal. The pure feed has a smooth, slightly oily feeling when rubbed between the fingers, and if adulterated it will feel more granular. Yellow corn meal can be detected by the yellow particles of the kernel, which are not found in the pure feed. Corncob can not be so easily detected."

Analyses of commercial feeding stuffs sold in Maryland, H. B. McDonnell (*Maryland Agr. Col. Quart., 1903, No. 22, pp. 2–10*).—In accordance with the State feeding-stuff law, which is quoted, the protein and other extract were determined in a number of samples of cotton-seed meal, linseed meal and flax meal, gluten meal and feed, hominy feed, corn oil-cake meal, mixed, commercial and proprietary feeds, poultry feed, animal bone, meat meal, and similar products. A list of licensed feeding stuffs is given.

Beet diffusion residue and molasses, M. Schmoeger (*Landw. Vers. Stat., 59 (1903), No. 1–2, pp. 83–155, figs. 10*).—The anatomical structure of beet tissue, the

composition and feeding value of beet sugar by-products, and related topics are discussed, the article being a critical summary of investigations which have been reported on these topics. The references to the publications cited are given in every case and constitute an extended bibliography of the subject.

Groundnuts in the West Indies (*Imp. Dept. Agr. West Indies, Pamphlet 25, 1903, pp. 26*).—A summary of information regarding the cultivation of peanuts, the composition and feeding value of peanut cake and meal, the possible uses of peanuts as food, etc.

Some results in steer feeding, D. W. May (*Kentucky Sta. Bul. 108, pp. 101–116, pls. 7*).—After a short preliminary period, a test was begun November 25 with 8 lots of 4 steers each to learn the relative value of a number of concentrated feeds largely used by Kentucky feeders. Part of the steers were grade Shorthorns and the others grade Angus. All were allowed the run of a closely cropped blue-grass pasture and at all times had free access to good clover hay. Lot 1 was fed ear corn, lots 2 and 8 corn-and-cob meal, lot 3 corn-and-cob meal and cotton-seed meal 3:1, lot 4 corn-and-cob meal, cotton-seed meal and bran 2:1:1, lot 5 corn-and-cob meal and gluten meal 3:1, and lots 6 and 7 corn-and-cob meal and dried distillers' grains in the proportion of 2:1 with the former lot and 1:1 with the latter.

At the beginning of the trial 16 to 18 lbs. of grain were fed per head per day, but as the test progressed the amount was increased and the proportion of ingredients in the grain mixtures was changed somewhat. The gains ranged from 1.66 lbs. per head per day in the case of lot 1 (ear corn) and lot 8 (corn-and-cob meal) to 2.23 lbs. with lot 7 (corn-and-cob meal and distillers' grains). With this latter lot less grain was required per pound of gain, and the gains were most economically made, the values being 8.82 lbs. and 8.9 cts., respectively. The largest amount of grain, 12.96 lbs., was required per pound of gain with lot 8 (corn-and-cob meal), and in this case also the gain was most expensive, costing 13.3 cts. per pound.

The steers were sold and slaughtered, the dressed weight being in every case not far from 61 per cent of the live weight. According to the author's calculations, ranking ear corn and corn-and-cob meal at the same price, the additional gains made on the ground grain were not profitable.

"With clover hay fed with corn there is less need for a nitrogenous grain feed than when corn stover, straw or other roughage richer in carbohydrates is fed. In this experiment, while less grain was required per pound of gain where nitrogenous by-products were fed, yet in some instances owing to the high cost of the by-products the gains cost more."

Dried distillers' grains with corn the author considers to be, under the experimental conditions, the most economical of the grain rations tested. "It proved not only the cheapest feed, but it took less grain per pound of gain when it entered largely into the ration. It seems probable that this by-product could be made much more profitable by drying and feeding as in this experiment, rather than by feeding directly from the still as slop."

As regards the effect of breed on gains made, the author states that, disregarding the 4 poorest animals, the Shorthorn grades required 10.88 lbs. of grain per pound of gain, and the Angus grades 11.85 lbs. "Experiments will not determine the superiority of one breed over another. They may indicate the differences between certain bunches of cattle, but the value of a breed of beef cattle will be established by the wisdom and the care of the improvers of that breed. . . .

"Whether type influences the rate of gain in beef cattle is a doubtful point that will take much experimenting to determine. . . . It seems probable that inheritance plays a more important part in the ability of an animal to lay on fat, as is often observed with mankind, and this factor of inheritance is one of the points considered in building up our beef breeds. As long as the butcher will pay more for the better type of cattle it will continue to be more profitable, laying aside other considerations, to grow that kind."

During the test 35 pigs, averaging 87 lbs. each in weight, followed the steers. Beside the undigested feed which they gathered they consumed 4,560 lbs. of refuse grain from the feeding troughs and gained 3,882 lbs. in weight.

Steer feeding, F. B. LINFIELD (*Montana Sta. Bul. 48, pp. 153–165, figs. 4*).—The comparative merits of different grain rations supplementing clover hay ad libitum were tested with 4 lots of 6 steers each, 3 lbs. of chopped grain being fed per head daily at first, the amount being later increased to a full feed of 5 lbs. In the 111 days of the test, which began December 1, 1902, the lot fed wheat made an average daily gain of 2.10 lbs.; the lot fed oats, 1.69 lbs.; the lot fed barley, 2.34 lbs., and the lot fed a mixture of equal parts of wheat, oats, and barley, 2.53 lbs., the average for all the rations being 2.15 lbs. per steer. The cost of a pound of gain ranged from 4.2 cts. on a mixed grain ration to 6.1 cts. on oats, averaging 5.2 cts. for all the rations. Considering the test as a whole, 12.8 lbs. of clover hay and 1.9 lbs. of grain were required per pound of gain.

Though the fact is recognized that definite conclusions can not be drawn, yet the author believes that the test indicates that a mixed grain ration is superior to a single variety of grain, the rations tested ranking as follows: Mixed grain 100, wheat 99.5, barley 84.5, and oats 84. It was noticed that the cattle tired of the wheat after about 2 months and a change was necessary to induce them to continue eating it. This, the author states, was likewise true of all the grains fed, but not to the same extent as with the wheat.

"After a gradual change of the rations to mixed grain with bran the cattle ate the mixture with relish and made the most rapid gains of the winter.

"The experiments made at the station for the past 3 years seem to show that on the average the profit to be made in fattening 2 to 3 year old steers, with Montana prices for feeding stuffs, must come from an increase in the value of the purchased weight of the steer.

"This fact, however, does not make less important the study of the relative values of feeding rations. In this test the difference in returns between the best and the poorest ration was $3.52 per steer, by no means an unimportant item."

Experiments in fattening lambs, F. B. LINFIELD (*Utah Sta. Bul. No. 78, pp. 55, figs. 2*).—Continuing work previously reported (E. S. R., 13, p. 174) on the value of local-grown feeding stuffs for sheep, a test beginning December 31, 1900, and covering 3 periods of 4 weeks was made with 4 lots, each containing at the start 25 lambs, weighing about 38 lbs. All were fed alfalfa hay. In addition lot 1 was fed wheat screenings, lot 2 chopped wheat, and lot 3 wheat screenings and bran. Lot 4 was fed straw in addition to alfalfa hay with bran also in the second period and bran and wheat screenings in the third period.

During the test the average daily gain on wheat screenings (lot 1) was 0.115 lb., on chopped wheat (lot 2) 0.110 lb., on wheat screenings and bran (lot 3) 0.118 lb., and on straw and grain (lot 4) 0.103 lb. per lamb. The grain eaten per pound of gain ranged from 2.82 lbs. with lot 4 (straw and grain) to 5.9 lbs. with lot 1 (wheat screenings). The former lot ate the largest amount of coarse fodder (13.43 lbs. of alfalfa and 0.81 lb. of straw) per pound of gain. The smallest amount (8.47 lbs. of alfalfa) was eaten by lot 3 on wheat screenings and bran. The cost of a pound of gain ranged from 4.67 cts. with lot 4 (straw and grain) to 6.28 cts. with lot 2 (wheat).

On January 16, 1902, a test similar to the above, except that molasses and sugar-beet pulp were also fed, was begun with 6 lots of lambs averaging 56 lbs. in weight, lots 1 and 2 each containing 16 lambs, and lots 3 to 6 each 17 lambs. As before, alfalfa hay was fed to all the lots, with grain or other feed in addition. On wheat screenings the lambs in lot 1 during the 78 days of the test made an average daily gain of 0.217 lb.; lot 2, on bran and molasses, 0.2 lb.; lot 3, on beet pulp ad libitum, 0.207 lb.; lot 4, on a limited amount of beet pulp (8 to 50 lbs. per lot daily), 0.133 lb.; lot 5, on beet pulp ad libitum, supplemented by equal parts of wheat screenings and bran,

0.330 lb.; and lot 6, on a limited amount of beet pulp (8 to 50 lbs. per lot daily) and the same grain mixture as the preceding lot, 0.214 lb. The cost of a pound of gain ranged from 2.94 cts. with lot 5 (pulp ad libitum and grain) to 4.22 cts. with lot 6 (a limited amount of pulp and grain), being on an average for all the lots 3.56 cts.

Discussing this and the earlier tests the author points out that with not far from 6 lbs. of alfalfa hay, 3.87 lbs. of wheat screenings were required per pound of gain. With the other grains tested the amounts were a little higher. Under similar conditions 17.86 lbs. of beet pulp were required per pound of gain in addition to 7.97 lbs. of alfalfa hay. Feeding bran and screenings diminished the amount of both alfalfa hay and pulp required per pound of gain. When beet-sugar molasses formed a part of the ration 1.42 lbs. of this material and 1.5 lbs. of bran, together with 8.1 lbs. of alfalfa hay, were required per pound of gain.

"The cheapest gains were made on the rations in which an excess of pulp was fed, and there is but slight difference in the cost of one pound of gain whether grain was fed or not with the pulp. In either case it was below 3 cts. The ration that came next in cheapness of gain was that in which molasses was fed. . . .

"In considering the profits to be obtained from any ration, yet another point must be kept in mind; that is, the value of the finished product. Our experience last winter showed that a full grain ration fattened the lambs more rapidly, and in a given time gave a finished animal that was worth more per pound. We thus obtained more for the original weight of the lambs as well as for the gains made. We received one-fourth cent per pound more for the grain-fed lambs. This would mean 14 cts. on the original weight of 56 lbs. per lamb, or $14 on a hundred lambs, an important consideration.

"Viewed in this light, the ration of lucern and mixed grain, or screenings, with or without beet pulp, proved the most profitable ration in fattening lambs."

Analyses are reported of the feeding stuffs used.

Sheep feeding, F. B. LINFIELD (*Montana Sta. Bul. 47, pp. 32, pl. 1*).—The comparative value of different grain rations (wheat screenings, wheat, oats, barley, and a mixture of equal parts of wheat, oats, and barley) supplementing clover hay in finishing sheep for market was studied with 5 lots of lambs and 5 lots of wethers. Two of the lots of wethers contained 23 animals and all the other lots 22 animals each at the beginning of the trial. The test covered 95 days in the winter of 1902-3.

The comparison was so arranged that each ration was tested with both lambs and wethers, the maximum amount of grain fed being 1 lb. per head daily. In the case of the lambs the gains ranged from 0.22 lb. per head per day on oats to 0.287 lb. on wheat screenings. With the wethers the gains ranged from 0.19 lb. on mixed grain to 0.287 lb. on barley. Considering the test as a whole the lambs made an average daily gain of 0.263 lb. at a cost of 4.49 cts. per pound and required 8.03 lbs. clover and 3.11 lbs. grain per pound of gain. In the case of the wethers the average daily gain was 0.238 lb. per head, the cost of a pound of gain 6.3 cts., and the feed required per pound of gain 13.49 lbs. clover and 3.38 lbs. grain.

The lots were marketed in Chicago, the dressed weight of the lambs and wethers being respectively 54.8 and 51.1 per cent of the live weight. When kept for 12 hours without food or water the lambs shrank 2 per cent in weight and the wethers 3 per cent. The author states that considering this test and other results obtained in the last 2 or 3 years, the shrinkage in shipping lambs has been 8.3 per cent and in the case of wethers 7.8 per cent, while on an average it has cost 78.66 cts. per head to ship and sell lambs and $1.165 to ship and sell wethers. Making allowance for the labor involved in feeding there was a profit in the test reported of $2.09 per lamb and $2.55 per wether.

Sheep-feeding experiment, O. C. HIGBEE (*Nebraska Farmer, 35 ([illegible]), No. 47, p. 1136*). On the basis of a test with 2,600 old sheep, the details of which are briefly reported, the feeding of cooked corn is recommended. The author believes that

"sheep will eat a greater quantity of corn per day cooked than dry, . . . will fatten enough faster to pay for the extra corn eaten . . . [and] can be fattened in a much shorter time."

The college lambs, J. D. Towar (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 3, pp. 142, 143*).—For several years raising lambs for early market has been studied, Dorset Horn and Shropshire sires being bred originally with high-grade merinos and later with first-cross Dorset ewes and Dorset-merinos.

"The Dorsets have each year come two or three weeks earlier, and with that advantage have each time excelled the Shropshires in the early market. Yet it has been commonly observed that the Shropshires made the faster growth, nearly overtaking the Dorsets by the time the latter were 4 months old. The young Dorsets . . . invariably commanded the higher price in the sale yard."

Experiments in feeding swine, E. E. Elliott (*Washington Sta. Bul. 58, pp. 24*).—The relative merits of full rations of different grains and grain mixtures were tested with 4 lots of 3 pigs each, most of them averaging a little over 100 lbs. in weight. In 8 weeks the lot fed rolled wheat made an average daily gain of 1.13 lbs. per pig at a cost of 3.07 cts. per pound, and the lot fed a mixture of rolled wheat and barley with ground peas 3:3:2 made an average daily gain of 1.14 lbs. per head at a cost of 3.64 cts. In the case of the lot fed rolled barley the average daily gain was 0.72 lb. per pig and the cost of a pound of gain 5.52 cts., and with the lot fed rolled wheat and barley 1:1 these values were, respectively, 0.71 lb. and 5.23 cts. Similar differences were observed in the feed required per pound of gain, the values being 4.73 and 4.07 lbs. for the lots fed rolled wheat, and peas and grain, and 7.35 and 7.47 lbs., respectively, for the lots fed rolled barley and a mixture of wheat and barley.

In a second test made under much the same conditions with 3 lots of 3 pigs each, the average daily gain per pig in 14 weeks was 0.59 lb. on a mixture of barley, wheat, oats, and peas 4:4:3:1, the cost of a pound of gain being 5.07 cts. and the feed required per pound of gain 6.37 lbs. The lot fed chopped barley made an average daily gain of 0.62 lb. per pig at a cost of 5.17 cts., requiring 6.53 lbs. of feed per pound of gain. The most satisfactory results were obtained with the lot fed chopped wheat, the average daily gain being 0.72 lb., the cost of a pound of gain 3.78 cts., and the feed required per pound of gain 5.25 lbs.

The principal conclusions drawn were in effect that wheat appears to be the feed best adapted for long-continued feeding. In each case the pigs receiving this grain made steadier advancement than any of the other lots.

The addition of peas or oats to a mixed ration did not show any practical advantage over wheat alone. "This should not be taken, however, as conclusive evidence against the feeding of these grains in combination." The greater cost of peas stands in the way of their profitable use as a grain feed when combined with the grains studied.

The results secured from barley were in both tests disappointing. Whether fed in combination or alone, it stood at the foot of the list.

The general results as regards the amount of food eaten are, it is believed, somewhat above the averages reported elsewhere. The same holds true of the gain per day.

With fat hogs bringing 5.5 to 6 cts. per pound, there is a large profit to be made in feeding wheat. This can not be said of barley.

In all the work done the fact stands out prominently that wheat alone when fed in a proper manner, and under conditions calculated to secure good results, will give greater profits than any of the other grains tested. "To expect to reap returns by throwing it on the ground in the mud, or without crushing or soaking it, or in some other way making it more palatable and digestible, is sure to result in failure."

To feed the animal below rather than up to the limit of its capacity is regarded as probably the wiser plan. During the feeding period the pigs must have sufficient exercise to enable them to maintain their appetite. No extra amount of care will replace this requirement.

The second of the reported experiments indicates that feeding hogs for a long period without change of rations or feeding grounds may prove decidedly unprofitable.

Clovers: Indispensable in a poultry dietary, H. E. Moss (*Reliable Poultry Jour., 10 (1903), No. 11, pp. 1038, 1039*).—The importance of fresh and cured red clover and alfalfa as part of a poultry ration is discussed. On the basis of experience the author believes that about one-third of the mash fed poultry should be made up of red clover or alfalfa. In addition to the nutrients which it supplies, clover is believed to heighten the color of the egg yolk.

DAIRY FARMING—DAIRYING.

Methods of milking, H. H. Wing and J. A. Foord (*New York Cornell Sta. Bul. 213, pp. 51–66, figs. 6*).—Tests of the Hegelund method of milking were made with the university herd and with 2 private herds.

Twelve cows of the university herd were divided into 3 groups of 4 cows each. Group A was milked in the regular manner for 5 weeks, with the exception, however, that the residual milk obtained by the Hegelund method was determined during the second and fourth weeks of the period. The conditions were the same for group B, except that the residual milk was determined during the second and third weeks. Group C was milked for 4 weeks, the residual milk being determined during the second week by stripping, and during the third week by the Hegelund method. The experiments began May 13 and closed June 17, a change from stable to pasture being made at the end of the second week. The average data are presented in the following table:

Yields per cow per week by regular and Hegelund methods of milking.

	Number of period.	Regular milking.		Residual milking.	
		Yield of milk.	Yield of fat.	Yield of milk.	Yield of fat.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Group A (4 cows)	1	189.9	7.435		
	2	189.0	7.204	7.28	0.605
	3	216.3	8.837		
	4	220.8	8.574	6.38	.528
	5	220.2	8.737		
Group B (4 cows)	1	174.7	6.338		
	2	169.0	6.073	9.43	.597
	3	189.5	7.135	8.73	.611
	4	198.9	7.040		
	5	195.1	7.316		
Group C (4 cows)	2	159.9	5.773		
	3	162.8	5.904	[a]10.36	.694
	4	163.2	5.721	10.30	.712
	5	167.2	5.951		
Average		186.9	7.003	8.75	.625

[a] Secured by stripping.

"Considering Group A, the figures seem to justify the conclusion that the residual milk procured by the Hegelund method in the second and fourth weeks was not detrimental to the production at the regular milkings: in other words, it would appear that the milk secured by after-milking was all gain.

"If the total weekly production from the regular milkings of Group B is studied carefully, and in connection with Group A, a similar conclusion may be made, although it is perhaps not so evident at the first glance."

The residual milk obtained either by after-milking or stripping varied from 3.75 to 13.60 lbs. per cow per week, and the fat from 0.401 to 1.011 lbs., the averages

being, respectively, 8.75 and 0.625. The residual milk secured by stripping was practically the same as that secured by the Hegelund method.

In a private herd of 9 cows the residual milk secured per cow per week averaged 4.91 lbs., containing 0.556 lb. of fat. In this experiment, which lasted only 2 weeks, it was quite apparent, however, that the regular milking was done more thoroughly than usual.

In another test of 1 day's duration the residual milk obtained from 9 cows by the Hegelund method averaged 1.94 lbs. per cow.

Results obtained at the Wisconsin Station are cited, and a description of the Hegelund method is quoted from Bulletin 96 of that station (E. S. R., 14, p. 694). "After reviewing all the work at both the Cornell and Wisconsin Stations, it seems safe to say that the advantage of the Hegelund method over stripping, under our conditions, still remains to be proved.

"It is the opinion of the writers that the stripping as well as the milking, except in unusual cases, should be done with the whole hand and not with the thumb and forefinger alone. In milking, the thumb should be turned out and never enclosed within the palm, as is often done. The hand should be opened wide enough to allow the teat to fill to its full capacity, aided by a slight upward pressure upon the udder; the thumb and forefinger should then be closed, followed by the second, third, and fourth fingers in the order named."

Clean milking is advised, and manipulations of the udder and stripping should be resorted to if necessary to accomplish this purpose.

Milk; its production and uses, E. F. WILLOUGHBY (*London: Charles Griffin & Co., Ltd., 1903, pp. 259, figs. 55*).—The author attempts to give "within a small compass and in a convenient form information on every question that might arise in connection with the economic, medical, or chemical aspects of the industry."

The book is written by a medical man, and is largely devoted to the sanitary aspects of milk production. Its value to the practical dairyman is very questionable, although considerable space is devoted to breeds of cows, stabling, feeding, diseases, and general equipment and management of the dairy. Indeed, some of the statements are so unwarranted as to cause surprise at their being incorporated in a book which otherwise has merit. For instance, in discussing the feeding of cows, the unqualified statement is made that "brewery grains, distillery wash, and silage must be condemned *in toto*," and the subject is dismissed with the further comment that they are injurious to the health of cows and render their milk easily prone to spoil and wholly unfit for infant feeding. In the chapter on the diseases of cows, the existence of contagious abortion is declared to be impossible, and supposed cases of this disease are explained by the cows "having partaken alike of the same poisonous plants."

Abstracts are given of sanitary regulations, and the Bang method of controlling tuberculosis is outlined. The composition of milk is discussed, and its value as a food and as a therapeutic agent is considered at some length. Cheese making is not treated, but a chapter is devoted mainly to butter making. The chapter on milk analysis is stated to be drawn mostly from Richmond's Dairy Chemistry. A concluding chapter is devoted to the bacteriological examination of milk.

The composition of milk in the north of England, II, S. H. COLLINS (*Jour. Soc. Chem. Ind., 23 (1904), No. 1, pp. 3–6, dgms. 3*).—Tests were made of 2 dairy herds in the north of England. One was represented by 12 cows, the milking being done at 5 a. m., 1 p. m., and 6 p. m. The tests were made during January, February, and March. The second herd was represented by 22 cows, the milking being done at 5.30 a. m. and 4.30 p. m.

The results for the first herd showed that the percentage of fat was below the legal standard of 3 per cent for 15 out of 72 tests of the morning milk, and 5 out of 72

of the evening milk. On only one occasion were the solids-not-fat below the legal standard of 8.5 per cent. The results for the second herd showed less than 3 per cent of fat on 5 out of 124 occasions in the morning and 11 out of 123 in the evening; and solids-not-fat less than 8.5 on 16 out of 122 occasions in the morning and 21 out of 124 in the evening.

Summarizing the results of the present study with those reported in a previous paper (E. S. R., 14, p. 695), it was found that 96 tests out of 984, or about 10 per cent, were below the standard. "These figures suggest that there is some truth in the opinion that milk in the north of England is not as rich as that in the south, and can not be judged by the same standard." On the basis of the tests of individual cows the author discusses the probability of the mixed milk being below the standard.

Aerated preserved milk (*British Med. Jour., 1904, No. 2245, pp. 84-86*).—This is an editorial account of the preservation of milk by aeration and pasteurization as carried out by a dairy company in England, the process consisting in (1) heating the milk to 150° F. and passing it through a machine in which the fat globules are broken up into small particles; (2) cooling to 40°, and aerating with a mixture of oxygen and carbon dioxid (3:1) under pressure of 50 lbs.; and (3) bottling in sterilized bottles and corking tightly, heating to 150° for 30 minutes, cooling, and again heating as before.

Milk bottled November 2, 1903, was sweet when tested December 8; an exception being made of 2 half-pint bottles which kept only until November 24. After opening the bottles the milk remained sweet at laboratory temperatures for from 4 to 8 days, which is considered the most remarkable fact in connection with the milk. The milk tasted perfectly sweet, although not absolutely the same as fresh milk. There was, however, no taste of boiled milk. The cream showed no tendency to rise, and could not be separated by centrifugal force. The main physical difference between this milk and fresh milk was in the extremely fine subdivision of the fat globules in the former case. No differences were observed as regards the quantity or quality of the different constituents. Artificial digestion experiments showed no difference in the digestibility of the treated milk and fresh milk. All 3 processes—the disintegration of the fat globules, aeration, and heating to 150°—were found essential to the success of the method.

The process of aeration and subsequent heating, as shown by bacteriological investigations, did not completely destroy all spore-bearing bacteria. Diphtheria bacilli added to the milk were not destroyed by aeration alone, but were apparently by aeration and subsequent heating. Caseous material from a tuberculous guinea pig was added to milk, one bottle being kept as a control and one subjected to aeration and heating. A guinea pig inoculated with the sediment from the control bottle developed typical tuberculosis in 18 days, while 2 guinea pigs inoculated with the treated sample showed no signs of the disease upon autopsy at the end of 28 days.

Homogenized milk, P. BUTTENBERG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 20, pp. 964-968*).—Attention is called to the effect of heat and mechanical action in delaying the spontaneous separation of cream, and a description is given of the method of Gaulin for rendering milk homogeneous in which these 2 factors, as well as that of pressure, are utilized. In this method milk heated to 85° C. is forced under pressure of 250 atmospheres through tubes of 1 mm. diameter and then between closely applied plates of agate and metal, by which process the fat globules are very finely divided.

While the fat globules in ordinary milk may vary in size from 0.0016 to 0.0100 mm., those in milk treated by this method measure usually about 0.0008, and seldom exceed 0.0028 mm. No separation of the fat was observed in a sample of this milk 6 months old, although it had been kept at 37° for 1 week. The apparatus in most common use requires 7 horsepower and permits the treatment of about 1,000 liters of

milk per hour. It is noted that factories are established in Germany, France, Belgium, Holland, England and Norway; and that milk so treated has been on the market for about 1 year.

In determining the fat in homogenized milk the Adams method gave much lower results than the Gottlieb method.

Report upon the results with different kinds of pure and impure milk in infant feeding in tenement houses and institutions of New York City: A clinical and bacteriological study, W. H. PARK and L. E. HOLT (*Sanitarian, 52 (1904), No. 410, pp. 13–41*).—It was the purpose of this investigation to compare the results of infant feeding in tenement houses in winter and summer and to determine how far such results were due to the character of the milk used, and also to what extent the results were modified by the care the infants received and the surroundings in which they lived.

The observations were made by a number of physicians during the summers of 1901 and 1902 and the intervening winter. In each case the period of observation was about 10 weeks and the conditions were, as far as possible, the same as before this period. Nearly all the infants were observed in their homes twice a week.

A bacteriological study was made of the milk used. In all 239 varieties of bacteria were isolated. Of this number 139 were grown in pure cultures and fed to kittens without injurious effects except in one instance. The results, as a whole, show no relation between special varieties of bacteria in milk and the health of infants. Several forms of milk were used, the poorest being that purchased from small stores. The bacteriological content of this milk ranged in the summer of 1901 from 4,000,000 to 200,000,000, and averaged about 20,000,000 per cubic centimeter. In the summer of 1902 it averaged about 3,000,000. During the winter the number of bacteria in the store milk ranged from 100,000 to 5,000,000, and averaged 400,000 per cubic centimeter. The form of heating milk generally employed was found to kill from 95 to 99 per cent of the bacteria.

Of the 211 cases under observation in the winter, 156 did well, 41 did fairly well, 8 did badly, and 6 died. Of the 421 cases under observation in the summer, 184 did well, 108 did fairly well, 88 did badly, and 41 died. The great difference in the results between winter and summer conditions is ascribed primarily to heat, bacteria and their products in the milk being considered a secondary factor except where contamination was extreme or pathogenic organisms were present.

"During cool weather neither the mortality nor the health of the infants observed in the investigation was appreciably affected by the kind of milk or by the number of bacteria which it contained. . . . During hot weather, when the resistance of the children was lowered, the kind of milk taken influenced both the amount of illness and the mortality; those who took condensed milk and cheap store milk did the worst, and those who received breast milk, pure bottled milk, and modified milk did the best. The effect of bacterial contamination was very marked when the milk was taken without previous heating; but, unless the contamination was very excessive, only slight when heating was employed shortly before feeding. . . . When milk of average quality was fed sterilized and raw, those infants who received milk previously heated did, on the average, much better in warm weather than those who received it raw. The difference was so quickly manifest and so marked that there could be no mistaking the meaning of the results." Children over 3 years of age were not ordinarily affected at any season of the year by the bacteria in the milk unless the contamination was excessive.

Pasteurization of milk: Conditions and processes necessary for the destruction of pathogenic bacteria without injuring the quality of the products, M. HENSEVAL and G. MULLIE (*Rev. Gén. Lait, 3 (1903), Nos. 4, pp. 73–80; 5, pp. 97–103; 6, pp. 121–126*).—This is essentially a review of recent investigations

on the sources of bacteria in milk; hygienic precautions to be observed in the production and handling of milk; changes in milk produced by heating, including the precipitation of albumin, the formation of a surface membrane, the lessening of the tendency of the cream to rise, the decomposition of the albuminoids and the destruction of ferments; the effect of pasteurization upon the digestibility of milk and upon its suitability for infant feeding, and more particularly the different methods of pasteurization.

The authors conclude that milk of unknown origin should be pasteurized, and that this process when properly done destroys the pathogenic bacteria without injuring sensibly the value of the milk as a food.

Influence of the "scalded layer" on the efficiency of pasteurization of milk, H. L. RUSSELL and E. G. HASTINGS (*Rev. Gén. Lait, 3 (1903), Nos. 2, pp. 34–39; 3, pp. 49–56*).—This article, which was read before the recent International Congress of Hygiene and Demography, is in part a summary of experiments previously noted (E. S. R., 13, p. 986). The resistance to heat of the tubercle bacillus, a micrococcus, and *Bacillus prodigiosus*, was greatly increased when the method of pasteurization used permitted the formation of a surface membrane. When heated in a closed vessel and subjected to constant agitation, thus preventing the formation of a surface membrane, a temperature of 60° C. maintained for 15 minutes destroyed all tubercle bacilli.

It is believed that when properly done pasteurization at 60° for 15 minutes is sufficient to destroy all nonspore-bearing pathogenic bacteria without materially altering the flavor or appearance of the milk or cream.

Destruction of tubercle bacilli in heated milk, W. RULLMANN (*Rev. Gén. Lait, 3 (1903), No 1, pp. 15, 16*).—Tubercle bacilli introduced into milk were not destroyed by heating at 65° C. for a half hour, the milk meanwhile being subjected to constant agitation.

Process butter, R. W. CLARK and J. A. CROCKETT (*Utah Sta. Bul. 79, pp. 56–61*).—This bulletin is issued as a warning against the promoters of a churning process claimed by them to increase the yield of butter by incorporating abnormally large quantities of water and casein. A sample of butter made by this process scored 44 points out of 100 and showed the following composition: Water 26.05, fat 67.35, casein 4.16, and salt 2.44 per cent. In several churning experiments at the station butter was made which showed a water content ranging from 22.86 to 36.37 per cent. The State law establishing a standard for butter of not less than 83 per cent of butter fat is quoted.

Influence of feeding cotton-seed meal and sesame cake on the properties of butter fat, A. J. SWAVING (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 3, pp. 97–115; abs. in Centbl. Agr. Chem., 32 (1903), No. 11, pp. 759–761*).—In 3 series of controlled experiments butter made from cows fed cotton-seed meal responded invariably to the Halphen reaction. This influence of cotton-seed meal was manifested within 24 hours from the beginning of the feeding period, and lasted several days after its close. The reaction varied to a certain extent with the amount of meal fed. In certain cases it was equivalent to that shown by an artificial mixture of 5 per cent of cotton-seed oil and 95 per cent of butter fat.

The cotton-seed meal exerted no appreciable influence on the yield of butter nor the refractometer and Reichert-Meissl numbers. Butter made from cows fed sesame cake, on the contrary, showed no transmission of the active principle of this material as determined by the Badouin and Soltsien tests.

The composition of the butter fat of individual cows in Holland, J. KLEIN and A. KIRSTEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 4, pp. [illegible]*).—The Köttstorfer, Hehner, Reichert-Meissl, and refractometer numbers were determined on 42 samples of butter fat obtained from 5 cows at different times during one

year. The cows varied in age from 4 to 13 years, and were in different stages of lactation when the samples were secured. The feeding also varied from time to time.

The glycerin varied in amount from 11.99 to 13.07, averaging 12.46 per cent; the total fatty acids from 94.18 to 94.63, averaging 94.48 per cent; the insoluble nonvolatile fatty acids from 84.23 to 90.46, averaging 87.86 per cent; oleic acid from 32.31 to 50.68, averaging 39.71 per cent; and the soluble volatile fatty acids from 4.07 to 9.95, averaging 6.47 per cent. The refractometer number varied from 41.7 to 45.9, and the Reichert-Meissl number from 19.1 to 43.5. Feeding and the stage of lactation are believed to be the most important factors affecting the composition of the butter fat.

Variations in the composition of butter, A. BONN (*Rev. Internat. Falsif., 16 (1903), pp. 129-132; abs. in Chem. Centbl., 1903, II, No. 26, p. 1461*).—The author reviews considerable analytical data concerning variations in the composition of butter, and draws the conclusion that some definite standard should be adopted. He suggests a saponification number of 218, a Hehner number of 88, and a content of volatile fatty acids as butyric acid of 5.5 per cent.

Making butter with ferments containing starch, J. VANDERPLANCKEN and A. J. J. VANDEVELDE (*Sep. from Rpt. 6, Flemish Cong. Nat. Sci. and Med., 1902, pp. 4*).—The Belgian law requires the addition of starch and sesame oil to oleomargarine in order to make it more easily detected. The authors observed that certain ferments used in butter making are mixed with starch, and their investigations showed that this starch appears in the finished butter, making it, therefore, impossible to determine with certainty the addition of oleomargarine by this method.—H. M. PIETERS.

A comparison of the bacterial content of cheese cured at different temperatures, F. C. HARRISON and W. T. CONNELL (*Rev. Gén. Lait, 3 (1903), Nos. 4, pp. 80-85; 5, pp. 103-111; 6, pp. 126-137; 7, pp. 150-155; 8, pp. 173-180*).—The bacterial flora of Canadian Cheddar cheese and the relation of the bacteria to the changes occurring during the process of ripening, were investigated at the Ontario Agricultural College at Guelph and the Eastern Dairy School at Kingston, Canada. The cheeses subjected to bacteriological examinations were cured (1) in an insulated curing room having a temperature varying usually between 60 and 65°, and averaging 62.2° F.; (2) in an ordinary curing room in which no attempt was made to control the temperature; (3) in cold storage at about 40° F.; and (4) in an ordinary curing room for 1, 2, or 3 weeks and then in cold storage.

The bacteria found were divided into 4 classes: (1) Lactic-acid bacteria, including several varieties, of which the commonest was *Bacillus acidi lactici;* (2) gas-forming bacteria, mainly varieties of *B. coli communis* and *B. lactis ærogenes*, but including occasionally a species resembling *Proteus vulgaris;* (3) digesting bacteria, consisting of *Micrococcus aureus lactis, M. varians lactis, B. fulvus,* and *B. halofaciens;* and (4) indifferent bacteria, including various forms of sarcina, yeast, and torula, *B. subtilis*, and occasionally one or two other species in small numbers. The lactic-acid bacteria were the only forms constantly present in very large numbers. The scorings and the bacteriological data are presented in detail in tabular form.

The bacterial content was usually highest at the time of taking from the press, although occasionally the maximum was not reached until 2 to 5 days later. The total number of bacteria in cheese under 4 days old varied from 110,750,000 to 635,000,000 per gram. After the first few days there was a gradual and continuous decline in the number of bacteria. The bacterial content remained high for a longer period, and the decline was more gradual in the case of cheese kept in cold storage than in cheese cured in an ordinary curing room. The cold-storage cheese showed invariably the highest bacterial content, and with this was associated better body and flavor in the cheese. It is therefore inferred that the higher bacterial content is the chief factor in determining the flavor of cheese properly made from normal

milk. The lactic-acid bacteria were practically the only species present, and these decreased, not only in number, but in acid-producing power, with the lapse of time. Undesirable species of bacteria were found in nearly all of the cheeses examined, but these were always in insignificant numbers and soon died out. They seemed unable to grow at a temperature of 40°.

In the Guelph experiments the cheese placed immediately in cold storage ranked first in quality, that placed in cold storage after 1, 2, and 3 weeks ranking next, in the order mentioned. In the Kingston experiments the cheese ripened in the regulated room was superior to that ripened in the ordinary curing room. According to the authors, the most noticeable fact concerning the best cheese was the high content of lactic-acid bacteria and the length of time that these organisms remained alive. The bacterial flora of the cheese made in the 2 localities was very similar.

Notes on Cheddar cheese making, R. T. ARCHER (*Jour. Dept. Agr. Victoria, 2 (1903), No. 2, pp. 137–140*).—Notes are given on the treatment of overripe milk and on the prevention of gassy curd.

Improved cream separator (*Sci. Amer., 89 (1903), No. 26, p. 482, fig. 1*).—A description of a new separator of the centrifugal type, recently patented.

Thirty-First Annual Report of the Wisconsin Dairymen's Association (*Madison, Wis.: Democrat Printing Co., 1903, pp. 192*).—Among the papers presented at the annual meeting held in February, 1903, mention may be made of the following: A Fond du Lac County Census and its Lessons, by C. P. Goodrich, in which data are given on the cost of food and the quantity and value of the product of different herds; Needs of the Wisconsin Cheese Industry, by U. S. Baer; Dairy Possibilities in Northern Wisconsin, by F. Reitbrock; The Wisconsin Feeding Stuffs Law and its Importance to the Farmer, by W. A. Henry, covering essentially the substance of Bulletin 97 of the Wisconsin Station (E. S. R., 14, p. 790); and reports of cheese and creamery instructors.

Missouri Dairy Association (*Mo. Bul. Missouri State Bd. Agr., 3 (1903), No. 9, pp. 50, figs. 3*).—Abstracts of the addresses delivered before the annual meeting held in December, 1903.

VETERINARY SCIENCE AND PRACTICE.

The care of animals, N. S. MAYO (*New York: The Macmillan Co., 1903, pp. XVI+459, figs. 59*).—In this volume the author seeks to give an account of the proper care of animals, with special reference to their physical needs and comfort in health and disease. Attention is called to the great importance of proper sanitation in preventing the development of animal diseases. The subjects discussed in the volume include feeding, watering, and exercise of animals; care of animals in stables and yards; care of pets; judging and handling horses; lameness and shoeing of horses; symptoms of diseases; treatment for diseases; surgical cases; breeding; veterinary obstetrics, and discussion of various animal diseases classified according to the part or organ affected. A chapter is also presented on the common prescriptions and doses of veterinary medicines.

Animal diseases, J. M. CHRISTY (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 14–[illegible]*).—Notes are given on sarcoptic, psoroptic, and symbiotic scabies of horses and mules, foot-and-mouth disease in cattle, scab in sheep, glanders, contagious pleuro-pneumonia, and rinderpest.

The diseases of stock and how to treat them, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, pp. 577–584*).—Brief popular notes on gall sickness, colic in horses, and respiratory diseases.

Veterinary studies for agricultural students, M. H. REYNOLDS (*St. Paul: Author, 1903, pp. XXIII+246, figs. 86*).—The purpose of this volume, as announced by the author, is to furnish material for class work in instruction of students in vet-

erinary science in agricultural colleges. The author found in his experience that students in such institutions were quite unequally prepared for veterinary instruction, and the various matters which are considered necessary for such instruction are included in this volume. The subjects discussed by the author include anatomy, physiology, pathology, cause and prevention of disease, a description of the common diseases of domesticated animals, obstetrics, and the administration of medicines.

Surgical and obstetrical operations for veterinary students and practitioners, W. L. WILLIAMS (*Ithaca, N. Y.: Author, 1903, pp. IX+210, figs. 48*).—This volume is based to a considerable extent upon Operationskursus, by W. Pfeiffer, with numerous additions by the author. The subjects discussed include operations on the head, neck, trunk, genital organs, extremities, and embryotomy.

Annual report on progress in the field of pathogenic micro-organisms, P. VON BAUMGARTEN and T. TANGL (*Jahresber. Fortschr. Lehre Path. Micro-organ., 17 (1901), 2. Abt., pp. XII+1114*).—This report contains extended bibliographies relating to pathogenic bacteria, fungi, and protozoa, together with brief abstracts of the more important articles. The material is classified according to subject-matter, and the abstracts and related bibliographical lists are brought together. Extended author and subject indexes are added to the report.

The most important Italian literature on general pathology and pathological anatomy published in 1902, O. BARBACCI (*Centbl. Allg. Path. u. Path. Anat., 14 (1903), No. 16–17, pp. 673–709*).—A classified list is presented of Italian literature published in 1902 relating to technique, methods of investigation, tumors, cell structure, immunity, intoxications, infectious diseases, organic diseases, etc. A brief abstract is given of the more important works.

Immunity and narcosis, J. J. SNEL (*Berlin. Klin. Wchnschr., 40 (1903), No. 10, pp. 212–214*).—The experiments recorded in this paper were undertaken for the purpose of determining the influence of narcosis upon the persistence of immunity. Guinea pigs were used for the experiment and were inoculated with anthrax. The narcotic substances used in these experiments included ether, chloroform, chloral hydrate, and morphin.

During these experiments it was found that a short narcosis produced by ether did not entirely destroy the bactericidal power of the lungs. The course of infection was shorter, however, when the narcosis was continued for a longer period. The bactericidal action of the lungs was restored soon after the narcosis was discontinued. Similar results were obtained from the use of chloroform, chloral hydrate, and morphin. In order to test the direct action of ether and chloroform upon anthrax bacilli, a comparative experiment was made, during which it was found that white mice inoculated with anthrax bacilli died within 24 hours, while mice inoculated with cultures which had been subjected to ether or chloroform fumes for 4 hours lived for periods ranging from 46 to 70 hours.

The author believes as a result of these experiments that the influence of narcosis is sufficient to bring about the death of infected animals as a result of the temporary destruction of the bactericidal power of the lungs.

The morphological processes in infection and immunity, A. WOLFF (*Berlin. Klin. Wchnschr., 40 (1903), Nos. 17, pp. 387–391; 18, p. 414; 19, pp. 434–436; 20, pp. 456–459*).—The author describes in detail the results of his study and observations on this problem. It was found that the leucocytes were sensitive to the action of iodin during infectious processes. There is no causal connection between iodin reaction and the phenomena of leucocytosis. These results are believed to militate against Metschnikoff's theory of immunity. In the peritoneal exudate of normal guinea pigs the leucocytes were often entirely absent.

The author's hypothesis concerning the cause of death in infectious diseases is that death takes place as a result of the absorption of bacterial products in the process of

bacteriolysis. It is believed that the appearance of leucocytes is merely a symptom which indicates the existence of a pronounced disintegration of cells or bacteria.

Annual report of the State Board of Live Stock Commissioners of Ohio, P. FISHER and W. W. MILLER (*Columbus, O.: State Bd. Live Stock Comrs., 1902, pp. 29*).—Notes are given on the prevalence of glanders, hog cholera, swine plague, tuberculosis, infectious keratitis, blackleg, anthrax, actinomycosis, and sheep scab. Copies are presented of various State laws and rules covering animal diseases and shipment of live stock.

Report of the chief inspector of stock for the year 1902, T. A. TABART (*Tasmania: Govt. Printer, 1903, pp. 1–8*).—Brief notes are given on sheep scab, dipping methods, quarantine, wool sales, anthrax and its treatment, and septic pleuro-pneumonia in calves.

Report of the government veterinarian, J. D. STEWART (*New South Wales, Dept. Mines and Agr., Stock and Brands Branch Rpt. 1902, pp. 25*).—Notes are presented on the inspection work during the year 1902 and on the prevalence of animal diseases. It was found during the progress of this work that the chief diseases of horses were ophthalmia, influenza, glanders, and troubles from infestation with botflies. In cattle the most important diseases were anthrax, actinomycosis, tuberculosis, Texas fever, and pleuro-pneumonia. Notes are also given on anthrax, scab, and flukeworms in sheep, and on the work of the veterinary department in the destruction of noxious animals.

Report of the chief inspector of stock and brands for the year 1902, P. R. GORDON (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 483–487*).—Notes are given on Texas fever and other diseases of animals which prevailed during the year, together with notes on the work of destroying injurious marsupials and other animals.

Notes from practice, R. SCHMIDT (*Berlin. Tierärztl. Wchnschr., 1903, No. 19, pp. 302–304*).—The author presents detailed notes on results obtained in the use of various Vasogen preparations in the treatment of different diseases. A combination of iodin and Vasogen was used successfully in the treatment of actinomycosis. In 6 cases this combination was more effective than a mixture of iodoform and Vasogen. The remedy was applied externally upon the actinomycotic wounds after they had been opened by surgical interference. Notes are also given on the use of this and other related remedies in the treatment of various diseases.

Animal and human tuberculosis, A. CIPOLLINA (*Berlin. Klin. Wchnschr., 40 (1903), No. 8, pp. 163, 164*).—The author carried on an experiment in feeding apes with tuberculous cows' milk. A culture of tubercle bacilli was obtained and 2 cc. of this material was mixed with 100 cc. of milk as a feed for apes used in the experiment. The feeding experiment was carried on for 1 month. After a period of 1½ months an ape showed symptoms of infection and died at the end of 3 months.

An autopsy showed the presence of serous peritonitis with numerous tubercles on the omentum. The mesenteric glands were enlarged and caseous and many other abdominal structures were involved. No lesions were found in the walls of the alimentary tract. The author concludes from these experiments that apes may be infected with tuberculosis through the walls of the alimentary tract without the production of primary lesions in that structure.

The identity of bovine and human tuberculosis, TROJE (*Deut. Med. Wchnschr., 29 (1903), No. 11, pp. 190–192*).—The author describes a number of cases of tuberculosis in man acquired by infection with bovine tubercle bacilli through accidental wounds. Notes are also given on cases of ingestion tuberculosis in man, with evidence of bovine origin of such cases. During the examination of these cases by way of comparison with other cases of human origin, the author found it was impossible to distinguish between the lesions formed in the human skin and lymphatic glands after infection with bovine tubercle bacilli and the lesions of ordinary lupus. It is

argued, therefore, that these cases furnish fresh proof of the identity of human and bovine tuberculosis and indicate the possibility of morphological variation in the bacillus during the process of adaptation.

Experimental demonstration of the unity of tuberculosis, S. ARLOING (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), May, pp. 257–278*).—An extensive series of experiments is reported, during which 46 animals were inoculated with tubercle bacilli. Of this number, 33 received human tubercle bacilli and 13 bacilli of bovine origin. The bacilli of human origin came from 5 cases of tuberculosis. During these experiments asses, goats, cattle, sheep, and hogs were inoculated with human tubercle bacilli, cattle, sheep, and goats with bovine tubercle bacilli, and cattle, sheep, and goats with equine tubercle bacilli.

The results were positive in every case, and the author concludes, therefore, that tuberculosis in man is transmissible to cattle and causes characteristic tuberculous lesions. The human tubercle bacillus is not always of the same virulence; in some cases it appears almost entirely to have lost its virulence, while in others it is fully as virulent as the bovine tubercle bacillus. It is believed that the variability in the virulence of the human tubercle bacillus is sufficient to account for the negative results obtained by Koch and Schütz.

Experiments in inoculating cattle with tubercle bacilli of different origin, H. KOSSEL (*Ztschr. Fleisch- u. Milchhyg., 13 (1903), No. 11, pp. 329–337*).—The experiments reported in this article were undertaken for the purpose of testing the foundation of Koch's assertion of the nonidentity of human and bovine tuberculosis.

During these experiments cattle inoculated with tubercle bacilli of bovine origin showed an enlargement of the prescapular lymphatic glands within from 8 to 10 days, and this swelling was preceded by the formation of an infiltration at the point of inoculation. About 10 days after inoculation a high fever developed, which persisted until the death of the animals in all acute cases. Infection with bovine tubercle bacilli, however, did not always produce an acute infection. The results obtained from inoculation of cattle with human tubercle bacilli showed that cultures of human origin are less virulent.

Cultures were obtained from 19 cases of pulmonary tuberculosis in man, and were inoculated hypodermically into cattle. An infiltration was formed at the point of inoculation, and the prescapular glands became enlarged within 8 to 14 days. When the animals were killed, 4 weeks after inoculation, living tubercle bacilli were found in the caseous masses at the point of inoculation, but the prescapular glands in the majority of cases had regained their normal size and appearance. In a few cases, however, caseous foci were still found in these glands.

The author also investigated 7 cases of primary intestinal tuberculosis in man, and from 39 cultures thus obtained cattle were inoculated for the purpose of determining the virulence of these bacilli. Four out of these 39 cultures were found to produce generalized tuberculosis in cattle. As a rule, however, the bacilli obtained from man were far less virulent than the bovine organism.

Ingestion tuberculosis, D. VON HANSEMANN (*Berlin. Klin. Wchnschr., 40 (1903), Nos. 7, pp. 141–144; 8, pp. 170–172*).—Notes are given on 25 cases of intestinal tuberculosis in man with special reference to the origin of these cases. The tubercle bacilli concerned in the production of these cases were of animal origin. Brief notes are given on ingestion tuberculosis in animals by way of comparison with data obtained in the study of human tuberculosis. The author believes that in both man and animals infection may take place through the healthy mucous membrane of the alimentary tract, without causing any lesion in that structure. As a rule, however, it is believed that infection takes place only during the presence of some other disease or when the resisting power of the mucous membrane is otherwise lowered.

The permeability of the young gastroenteric mucous lining for tubercle bacilli, DISSE (*Berlin. Klin. Wchnschr., 40 (1903), No. 1, pp. 4–7, figs. 4*).—From the

author's study of the structure of the mucous membranes in young animals it is concluded that this membrane in the stomach of new-born animals is comparatively thin and increases in thickness as age advances. The mucous lining of the intestines, on the other hand, is about as thick in the young as in the adult animal. The author describes the microscopic features of the mucous membrane in so far as they are related to the permeability of this membrane by tubercle bacilli.

Combating tuberculosis, E. VON BEHRING (*Berlin. Klin. Wchnschr., 40 (1903), No. 11, pp. 233–238*).—The author describes his method of immunization by means of attenuated cultures of tubercle bacilli, and presents notes on the effect of repeated injections of tuberculin in tuberculous animals.

Pulmonary tuberculosis and means of combating this disease, E. VON BEHRING (*Deut. Med. Wchnschr., 29 (1903), No. 39, pp. 689–697*).—The author discusses in a general way the ordinary means of transmission of tuberculosis in both animals and man, attributing the chief source of pulmonary tuberculosis in man to the milk used during infancy, which is likewise believed to be the chief source of tuberculosis in animals.

It is suggested that a great improvement would be made in the sanitary control of milk if it were pasteurized at the point of production and before being sent to distributing centers. The resulting product would thus be obtained in a better condition, both for feeding calves and other young domesticated animals, and as food for children. The author argues that the danger from feeding tuberculous milk to young children or animals can not be exaggerated. The possibility of extending the immunization processes devised by the author for cattle and man is also suggested.

Vaccination against tuberculosis in cattle according to the method of E. von Behring, G. REGNÉR and O. STENSTRÖM (*Meddel. K. Landtbr. Styr. [Sweden], 1903, No. 88, pp. 36*).—A detailed account is given of a method of immunization as applied to cattle by E. von Behring in Marburg. The results thus far obtained indicate that the method is practicable and satisfactory.

Immunization against tuberculosis, F. NEUFELD (*Deut. Med. Wchnschr., 29 (1903), No. 37, pp. 653–656*).—The author's experiments were made on 46 goats, 9 asses, and numerous cattle. The method of procedure was based on the assumption of the nonidentity of human and bovine tuberculosis, the idea being to immunize species of animals which are susceptible only to the one kind of virus, by a previous treatment with the other kind. The general plan of immunization was to treat the animals first with preparations of dead tubercle bacilli, then with increasing doses of living cultures, first of human tuberculosis and finally of bovine tuberculosis.

The results show that it is possible to immunize goats, asses, and cattle by intravenous injections of living human tubercle bacilli so that these animals resist subsequent infection with doses of virulent bovine cultures which would be fatal to untreated animals.

The immunization of the organism against tuberculosis, E. MARAGLIANO (*Berlin. Klin. Wchnschr., 40 (1903), Nos. 25, pp. 563–567; 26, pp. 593–596*).—The author believes that in the process of agglutination by the serum of tuberculous animals, substances present in the blood play an important rôle and exercise a specific action upon the tubercle bacillus. The agglutinative action of the serum of animals is therefore considered as a proof of resisting power on the part of the animal. In addition to the substances which are normally present in the blood to protect the animal against infection, new substances develop after infection with pathogenic bacilli.

The author describes a number of his experiments in immunization of animals against tuberculosis, which it is stated were begun in 1895. He has succeeded in immunizing cattle, horses, asses, goats, sheep, and dogs against tuberculosis. In one case success was had in immunizing a rabbit against this disease. Some of the animals have been under observation for 5 years and the immunization is believed to

be complete. The author maintains that immunization can be brought about either by the use of active cultures of tubercle bacilli, or with dead and desiccated bacilli. It is also held that it is not necessary to make intravenous inoculations in order to obtain immunity.

Attention is called to the possibility of applying this method of immunization in the treatment of human tuberculosis. During the author's experiments it was found possible to prepare a vaccine material which produced a tuberculous inflammation when injected hypodermically, and immunity resulted from the substances developed at the point of injection.

The cause of error in diagnosing tubercle bacilli in blood clots, F. Bezançon et al. (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 5, pp. 203, 204*).—The authors allude to the fact that in the examination of clotted blood from tuberculous animals organisms may sometimes be observed in colonies and may resemble in all essential respects the bacillus of tuberculosis. This resemblance may include the staining reaction, acid-fast condition, and other characters. The authors maintain that it is frequently necessary to resort to experimentation in the laboratory in order to determine definitely whether one is dealing with tubercle bacilli or other acid-fast bacilli.

The legal requirement for the determination of tuberculosis in all living animals, Thiro (*Berlin. Tierärztl. Wchnschr., 1903, No. 17, pp. 279–282*).—Attention is called to the extreme difficulty met with in attempting to diagnose tuberculosis ante-mortem. Such diagnoses must depend upon a physical examination, bacteriological examination of sputum, and of the superficial lymphatic glands, etc. In the opinion of the author it is in many cases absolutely impossible to give a correct diagnosis from an examination of the living animal, and it is urged that the legal requirement of a positive diagnosis will lead to many faulty diagnoses and to loss of reputation on the part of veterinarians.

The action of dead tubercle bacilli and the toxins of tubercle bacilli, V. Klingmüller (*Berlin. Klin. Wchnschr., 40 (1903), No. 34, pp. 778–780*).—In order to determine the cause of swellings and pathological changes at the point of injection of tuberculin, the author made a careful study of these tissues. It was found that in numerous cases typical tuberculous formations were present with epithelioid and giant cells. It appears, therefore, that tubercle bacilli in some form may be present in the tuberculin.

During the author's investigation 10 samples of tuberculin were examined, and in 4 samples tubercle bacilli and disintegrated fragments were found. After subjecting these samples to live steam at a temperature of 105° C. for 1 hour and filtering through moist cotton batting, bacilli were still present, and were only removed after filtration through clay filters. Inoculation experiments showed that the tubercle bacilli in samples of tuberculin were not alive and were not capable of producing tuberculosis. It is believed, therefore, that the alterations caused at the point of injection of tuberculin are due to the presence of dead tubercle bacilli. The toxins of the tubercle bacillus are thus capable of producing tuberculous alterations in the tissue.

Generalized tuberculosis in hogs, K. Müller (*Ztschr. Fleisch- u. Milchhyg., 13 (1903), No. 11, pp. 350, 351*).—Notes are given on the lesions and pathological anatomy in cases of generalized tuberculosis in hogs. In 1 case, which is described in detail, it was found that the hog had received large quantities of raw milk as food.

The diagnosis of anthrax and blackleg, R. Ostertag (*Ztschr. Fleisch- u. Milchhyg., 13 (1903), No. 7, pp. 213–216*).—The author agrees with the contentions of certain veterinarians that the requirement of a bacteriological diagnosis of anthrax and blackleg is unnecessary and sometimes unreliable. It is argued, however, that as a rule the bacteriological test gives reliable results and it is urged that the law does not work any excessive hardship upon veterinarians.

Verification of the diagnosis of anthrax and blackleg, Tillmann (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 11, pp. 97-100*).—The author takes the position that the obligatory bacteriological verification of the diagnosis of anthrax and blackleg has no good scientific basis and should be discontinued, both on the ground of being dangerous and also because it is unsatisfactory. It is recommended that such verification of a clinical diagnosis be left to the discretion of the district veterinarians and similar officials.

The action of iodin on the virus of anthrax and blackleg, and the possibility of transforming either virus into vaccine by the addition of Lugol's solution, V. Galtier (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), Aug., pp. 462-467*).—The author made a number of experiments in inoculating rabbits and guinea pigs with anthrax and blackleg cultures, after these had been treated with iodin and Lugol's solution.

As a result of these experiments it was found that the addition of 2 cc. of Lugol's solution to each 1 cc. of a sporulated anthrax culture at the time of inoculation was sufficient to prevent an infection with anthrax in rabbits and guinea pigs and to change the virus into a vaccine which produced considerable immunity in the experimental animals. Similar results were obtained in experiments with blackleg virus. This virus was rendered harmless for guinea pigs when mixed with large doses of Lugol's solution, or when exposed for a considerable time to a small dose of iodin.

A new method of vaccination for blackleg, Baer (*Berlin. Tierärztl. Wchnschr., 1903, No. 12, pp. 194, 195, fig. 1*).—Notes are given on a needle especially designed for use in vaccinating cattle against blackleg by means of the so called "Blacklegine" threads.

Report to the Minister of Education concerning investigations on foot-and-mouth disease, Löffler (*Berlin. Tierärztl. Wchnschr., 1903, No. 13, pp. 209-215*).—A mixture was made of immune serum and attenuated lymph, and large numbers of animals were vaccinated with this mixture to test its efficacy in checking foot-and-mouth disease. Animals treated with this mixture were allowed to reenter infected premises within from 10 days to 3 weeks after treatment. It was found that the majority of animals thus treated had developed an immunity sufficient to resist natural infection after a period of 3 weeks.

In practical tests of this method it was found that vaccinated animals developed an immunity while remaining in constant association with infected animals. The method used by the author has been found effective in immunizing cattle, hogs, and sheep against foot-and-mouth disease. The use of a mixture of a horse serum and serum from cattle which had recovered from the disease was very effective in producing immunity in healthy cattle. A number of cattle were immunized by the administration of increasing doses of lymph. In numerous experiments carried out by the author young pigs were found to be the most suitable animals for the continuous cultivation of an immunizing lymph for general use.

The method of Baccelli applied in the treatment of cattle affected with foot-and-mouth disease, I. Sacchini (*Clin. Vet., 26 (1903), Nos. 3, pp. 13-16; 5, pp. 25-28; 7, pp. 39-43; 9, pp. 53-57; 11, pp. 63-67; 13, pp. 75-79; 15, pp. 89-92; 17, pp. 101-104*).—The author made a study of the method proposed by Baccelli, viz, intravenous inoculations with corrosive sublimate in the treatment of foot-and-mouth disease in cattle. Three injections were given at intervals of 2 or 3 days, the corrosive sublimate being administered intravenously in doses of 5 cgm. from a solution containing 100 parts water, 1 part corrosive sublimate, 1 part sodium chlorid.

During these experiments the author found that cattle could receive 9 cgm. of corrosive sublimate without suffering any harm and that doses of 5 cgm. lowered the temperature and relieved the symptoms of the disease, even where the hoofs and mouth were badly affected, and in general led to a comparatively rapid recovery from the disease with cicatrization of the old lesions.

Texas fever, A. R. Ward (*California Sta. Circ. 1, pp. 7*).—Brief notes are given on the symptoms, post-mortem lesions, etiology, and means of transmission of this disease. Methods of controlling the disease are also outlined.

How can we exterminate the cattle tick? H. A. Morgan (*Proc. Louisiana State Agr. Soc. and Stockbreeders' Assoc. 1903, pp. 77–79*).—The necessity for improving the beef and dairy herds of the South involves strict sanitary measures in controlling Texas fever. While immunity can be produced in susceptible animals by inoculation with the blood of animals which have recovered from Texas fever, it seems desirable to adopt measures looking toward the destruction of the tick. The author maintains, however, that no success can be hoped for from any method of tick extermination without cooperation among the farmers.

Some experiments in inoculation for redwater, E. B. Maclean (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 58–60*).—During the author's first experiments in inoculation for this disease, from 10 to 20 per cent of the inoculated animals died within 3 weeks after inoculation. In these experiments more than 6,000 cattle were inoculated, and at last the loss from inoculation was reduced to from 2 to 3 per cent. The doses of defibrinated blood used in these experiments were 5 and 6 cc.

Rhodesian tick fever, S. B. Woollatt (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 19, pp. 704–709*).—From experiments and observations thus far made the author believes that this disease is undoubtedly carried by ticks, which leave the cattle during the larval and again during the nymph stage, but it is only in the adult condition that they are virulent. The symptoms and post-mortem appearances of Rhodesian fever are described in detail.

Cause of the cornstalk disease in cattle, R. E. Buchanan (*Iowa Agr., 4 (1903), No. 1, pp. 24, 25*).—Brief mention is made of the various theories which have been proposed in explanation of the cause of cornstalk disease. These theories have explained the etiology of the disease by reference to poisonous weeds, impaction of the stomach, corn smut, prussic acid, saltpeter, and the organism which causes the bacterial disease of corn. This account is largely based on the results obtained during the investigation of the subject by the Nebraska Experiment Station.

Hemorrhagic septicemia, Krueger (*Berlin. Tierärztl. Wchnschr., 1903, No. 16, pp. 261–264*).—The author had occasion to observe this disease in 118 cattle, horses, and hogs. The disease assumed several forms, including pectoral, exanthematic, and intestinal. Detailed notes are given on the symptoms observed in this disease. A large number of cases of croupous pneumonia in cattle are believed to have been caused by the organism of hemorrhagic septicemia, and attention is also called to the close resemblance between hemorrhagic septicemia and anthrax in hogs.

The author does not believe that any great danger exists of infection in man from handling animals affected with this disease. It is recommended, however, that as a rule animals affected with hemorrhagic septicemia be treated in the same manner as those affected with anthrax.

Puerperal metritis, A. Rodrigo (*Gac. Med. Zool., 27 (1903), No. 9, pp. 148, 149*).—Notes are given on the symptoms, course, and etiology of this disease.

Tetanus in cows, Burgeon (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), May, pp. 280–282*).—A case of traumatic tetanus was treated with antitetanus serum without success. The animal received 110 cc. of serum.

The antitoxin treatment of tetanus, E. von Behring (*Deut. Med. Wchnschr., 29 (1903), No. 35, pp. 617–621*).—The author presents a general discussion of the results which have thus far been obtained in the use of antitoxin in cases of tetanus. The rate of mortality without the antitoxin treatment is shown to be about 88 per cent, while with the antitoxin treatment it has been reduced to from 40 to 45 per cent. Numerous experiments were made on mice for the purpose of determining the proper strength of the serum for use in vaccination.

Cattle poisons of the Transvaal, J. B. Davy (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 96–101*).—The Transvaal department of agriculture has begun the study of

poisonous plants, and preliminary notes are given on the symptoms produced by a number of these plants and on the remedies which have been found effective. The greatest amount of poisoning from plants occurs in early spring before the grass has started up. Some of the more important species of poisonous plants are *Dichapetalum cymosum*, species of Moræa, *Datura stramonium*, *D. tatula*, and oleander. Notes are also given on poisoning from sorghum and Kafir corn.

Bacillus pyogenes suis, B. pyogenes bovis, and the bacteriological findings in chronic mammitis of milch cows, F. Glage (*Ztschr. Fleisch- u. Milchhyg., 13 (1903), No. 6, pp. 166–175*).—A study was made of the organisms mentioned in the title of this article, with special reference to the etiology of chronic mammitis with abscesses. The morphological and biological characters of the organisms are compared in detail. The author concludes that *B. pyogenes suis*, *B. pyogenes bovis*, and the bacillus found in chronic mammitis are all identical, and that this organism is the most common pyogenic bacillus of the hog and cattle. The organism was frequently found in suppurative mammitis and it is believed that it may be transmitted from cattle to hogs in the milk of diseased cows.

The etiology of swine plague, W. Grips (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 20, pp. 185, 186*).—In the author's opinion the appearance of small yellow or gray necrotic areas in the lungs of hogs affected with swine plague is not a constant symptom of the disease. During a study of this disease, *Bacillus pyogenes suis* was found in the lungs of hogs and the disease was transmitted to healthy hogs by inoculation with this organism and feeding experiments during which the same bacillus was employed. The author believes therefore that this organism is the cause of swine plague and that the micro-organism described by Löffler and Schütz is not connetced with the disease in a causal manner.

The etiology of swine plague, R. Ostertag (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 21, pp. 193, 194*).—Referring to an article on the same subject by W. Grips, the author agrees with a statement of Grips that small yellow or gray necrotic areas are not always present in cases of swine plague. It is believed, however, that the Löffler-Schütz organism is the cause of the disease and that *Bacillus pyogenes suis* is associated with this organism in a number of cases of swine plague. The author urges that the production of pneumonia in hogs by inoculation with *B. pyogenes suis* does not prove that this organism is the cause of swine plague, but simply that in common with other bacteria belonging to the same group, it is capable of setting up a process of suppuration.

The vaccine material for swine erysipelas prepared by the Jenner-Pasteur Institute at Budapest, L. Detre-Deutsch (*Berlin. Tierärztl. Wchnschr., 1903, No. 16, pp. 265, 266*).—The method of serum vaccination used by the Jenner-Pasteur Institute at Budapest requires 2 inoculations at intervals of about 12 days. This method has been used chiefly in the control of swine erysipelas and has been tested in 9,250 animals. In this number of animals not a single case developed swine erysipelas after vaccination. The treatment appears therefore to be perfectly safe and effective.

The most convenient position of hogs for vaccination, K. Müller (*Berlin. Tierärztl. Wchnschr., 1903, No. 17, pp. 278, 279*).—For holding hogs during vaccination the author recommends the use of a strong cord which is inserted in the mouth and fastened over the head. As a rule 1 man is able to restrain hogs of ordinary weight by this method during vaccination.

Paralysis of young colts, Zwicker (*Berlin. Tierärztl. Wchnschr., 1903, No. 12, pp. 197, 198*).—While the term lameness or paralysis of young colts has been used to include all the more pronounced functional disturbances in the extremities, it is quite apparent that a considerable number of diseases bring about symptoms of lameness. One of these is infectious omphalitis, with secondary pyemic inflammation of the joints.

The author's attention was devoted largely to forms of articular lameness or paralysis due to improper diet and unsanitary surroundings during early life. In the treatment of this form of the disease good results were obtained from blood letting and from rubbing the affected joints with a mixture of sulphuric acid and rectified spirits in the proportion of 1:6. This remedy applied twice daily was sufficient to bring about a cure in cases of not too acute nature.

The army horse in accident and disease, A. PLUMMER and R. H. POWER ([*U. S. War Department*] *1903, pp. 91*).—A brief discussion of the conformation of horses and external diseases; stable management; administration of medicines; anatomy; wounds, sprains, and bruises; diseases of the respiratory, digestive, urinary, nervous, and lymphatic systems; miscellaneous diseases; diseases of the skin, eye, feet, and bones; detection of lameness; and the action and uses of medicines used in the treatment of diseases of the horse.

Diseases and disorders of the horse, A. THEILER (*Transvaal Agr. Jour., 1 (1903), No. 2, pp. 30–39*).—A brief account of "through the water," strangles, lampas, stomatitis, colic, mange, etc. The author mentions the symptoms, pathological alterations, and treatment for each disease.

The transmission of horse distemper by coitus, A. GRIMME (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 12, pp. 109–111*).—The author found during an outbreak of this disease that stallions which have once been infected may retain the virus in the body for at least 14 weeks and are capable of transmitting the disease in a large percentage of cases in coitus.

Data on petechial fever in horses, J. J. IBARS (*Gac. Med. Zool., 27 (1903), No. 20, pp. 328–330*).—The symptoms of this disease are described by way of comparison with those of other related diseases and a brief account is given of the etiology of the disease.

Epizootic lymphangitis, A. THEILER (*Transvaal Agr. Jour., 2 (1903), No. 5, pp. 52–55*).—A description is given of the yeast fungus which causes this disease. The species concerned is believed to be *Saccharomyces farciminosus*. The disease occurs most commonly in horses and mules, but occasionally attacks cattle. Notes are given on the symptoms and pathological lesions of the disease. The author used a mallein test on horses affected with the disease, but obtained a reaction in only 2 cases. Treatment is believed to be without results except in mild cases and when applied during the early stages.

Poisoning from moldy clover, BANSSE (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), Feb., pp. 93–96*).—The symptoms of poisoning in a horse, resulting from the ingestion of moldy clover, are described in detail. The case was subjected to medicinal treatment without good results, and finally died. An autopsy was made and it was found that quite pronounced lesions were present in the kidneys and liver, both organs being congested and somewhat infiltrated.

Intestinal coccidiosis in fowls, ECKARDT (*Berlin. Tierärztl. Wchnschr., 1903, No. 11, pp. 177–180*).—During a comparative study, which was made for the purpose of determining whether fowl plague and fowl cholera were identical or not, the author found a large number of fowls to be suffering from coccidiosis of the intestines.

The blood of fowls affected with this disease when used in inoculation experiments with other fowls proved to be noninfectious. Feeding experiments with portions of infected intestines, however, reproduced the disease in nearly all cases with fatal results in a large proportion of the experiments. The disease was transmitted in feeding experiments to chickens and fowls of all ages. The symptoms produced during an infection were swelling and reddening of the intestinal membrane and the development of a greenish color in the intestinal contents. The prevalence of this disease seems to be immediately connected with unsanitary conditions in large poultry establishments. The disease prevails most extensively from May to July.

A study of the nature of fowl plagues, D. CALAMIDA (*Centbl. Bakt. u. Par., 1.*

Abt., Orig., 35 (1903), No. 1, pp. 37–42).—The author investigated an outbreak of disease among chickens in Turin. The combs, lungs, liver, spleen, and kidneys appeared perfectly normal while the alimentary tract was affected in various ways, according to the duration of the disease. A microscopic and bacteriological investigation failed to reveal the presence of any micro-organism, but the author believes that the disease is due to an organism sufficiently small to pass through a porcelain filter. Inoculation experiments with animals showed that the virus was pathogenic for chickens but not for rabbits.

Parasitological notes, B. GALLI-VALERIO (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1903), No. 1, pp. 81–91, figs. 4*).—Brief notes on various plant and animal parasites, including the organisms of favus and herpes; various protozoan parasites of guinea pigs, rats, lizards, etc.; the infestation of dogs with *Bothriocephalus latus;* and *Ankylostoma duodenale* as affected by bisulphate of soda in a 2 per cent solution.

The beef measle worm in the slaughterhouse of Trieste, J. SPADIGLIERI (*Ztschr. Fleisch- u. Milchhyg., 13 (1903), No. 5, pp. 136–139*).—The examination of beef during the ordinary meat inspection in the slaughterhouse at Trieste yielded valuable data on the occurrence of the beef measle worm and its relative distribution in various muscles. This parasite is found most extensively in the internal and external muscles of mastication.

Trichinosis and heredity, A. O. DE LANDÁZURI (*Gac. Med. Zool., 27 (1903), No. 16, pp. 261–264*).—Attention is called to the possibility of intrauterine infestation by trichina in hogs, and a few cases are cited in which such a method of infestation appeared to be demonstrated. In such cases it was urged that the public should be warned against the use of the meat of young pigs.

AGRICULTURAL ENGINEERING.

Irrigation engineering, H. M. WILSON (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd. (1903), 4. ed., rev. and enl., pp. XXIII+573, pls. 41, figs. 142*).—This is the fourth revised and enlarged edition of this work. While the revision has been thorough it has involved no radical changes, although many important corrections and additions have been made, especially in part 3, which relates to storage reservoirs.

Murray waters and irrigation, R. T. MCKAY (*Agr. Gaz. New South Wales, 14 (1903), Nos. 7, pp. 611–626, figs. 17; 11, pp. 1088–1101, figs. 13*).—A continuation of the preceding article (E. S. R., 14, p. 1055), giving additional information regarding irrigation in the Murray basin.

Water supply, R. E. MIDDLETON (*London: Charles Griffin & Co., Ltd. (1903), pp. IX+168*).

Windmill irrigation in Kansas, P. EASTMAN (*Amer. Mo. Rev. of Reviews, 29 (1904), No. 2, pp. 183–187, figs. 8*).—A description of the system and results of irrigation with water pumped by means of windmills in the subarid region of western Kansas, especially around Garden City.

Windmills, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 49, pp. 737–740, fig. 1*).—A note on the report of Courtney and Shaw on the exhibit of windmills under the auspices of the Royal Agricultural Society of England at the Royal Park in March and April, 1903.

The practical working of trench excavating machinery, E. MCCULLOUGH (*Engineer. News, 50 (1903), No. 26, pp. 562–564, figs. 2*).

Trial stations for machinery, implements, and tools used in agriculture and dairying, F. WITTING (*Queensland Agr. Jour., 13 (1903), No. 6, pp. 524–528*).—This is a brief account of the history of the establishment of such stations in Sweden, one in connection with the agricultural college at Alnarp, southern Sweden, and the other in connection with the college at Ultuna, central Sweden. The character and value of the tests made are also explained.

German and English agricultural machine industry, G. KÜHNE (*Mitt. Deut. Landw. Gesell., 18 (1903), Nos. 45, pp. 253–255; 46, pp. 258–260; 47, pp. 262–264*).—A general review.

Steam plowing a success, J. H. CONNELL (*Texas Farm and Ranch, 23 (1904), No. 2, pp. 1, 2, figs. 5*).—The conditions under which steam plowing may be successful and the cost of operating such plows are discussed, and satisfactory experience of a number of farmers is reported.

Electricity in agriculture, E. GUARINI (*Jour. Soc. Cent. Agr. Belg., 51 (1903), No. 1, pp. 18–29*).—This is a review of the progress which has been made in the application of electricity to various agricultural processes and operations, including its use as a motive power, for promoting the growth of plants directly and by means of electric lights, the purification of water, etc. The possibilities of the Cooper-Hewitt mercury-vapor lamp are briefly referred to.

Alcohol motor cars for agricultural purposes, A. OSCHMANN (*Arb. Deut. Landw. Gesell., 1903, No. 86, pp. 84, figs. 86*).—This is a report of tests made during 1903 by the agricultural implements section of the German Agricultural Society, and includes a discussion of motor cars in general, details of construction of such cars, and the results of tests of (1) a motor freight train, (2) an express wagon, and (3) a milk wagon, furnished by 3 different firms.

Reinforced concrete and its applications, P. CHRISTOPHE (*Le béton armé et ses applications. Paris and Liége: Ch. Béranger, 1902, pp. XIX + 755, figs. 847*).—This is a second revised and enlarged edition of this work, the first appearing in 1899.

The story of refrigeration, R. CROWE (*Jour. Dept. Agr. Victoria, 2 (1903), No. 2, pp. 129–136*).—A general discussion of the subject of refrigeration with special reference to conditions and experience in Victoria. The special topics discussed are practical application of refrigeration, ripening of cheese in cold storage, and cold storage of eggs.

Report of the committee on rural engineering of the Association of American Agricultural Colleges and Experiment Stations, W. E. STONE ET AL. (*U. S. Dept. Agr., Office of Experiment Stations Circ. 53, pp. 10*).—This report reviews the present status of instruction and research in rural engineering in this country and points out the necessity for improvement along these lines. It recommends the creation of separate departments of rural engineering in the agricultural colleges and commends the efforts of the Secretary of Agriculture to extend work of this character in his Department.

MISCELLANEOUS.

Growth and management of American agriculture, F. T. CARLTON (*Ann. Amer. Acad. Polit. and Soc. Sci., 22 (1903), No. 3, pp. 79–91*).—A discussion based upon the statistics of the last census. Attention is especially called to the following conditions indicated by an analysis of these statistics: The readjustment and localization of production as a result of better transportation facilities; and concentration of population in cities and decline of small towns and villages, accompanied by unhealthy unrest in the former and idleness in the latter. It is suggested that long-distance transmission of electrical power will do much to remedy this condition by reviving small industries and providing local markets.

Improved educational facilities in the country, it is believed, will do much to check the influx of rural population into the cities. The advantage of country training over city training in developing the power of adaptability is pointed out, and it is urged that rural schools should always keep in view the training of men and women for farm duties.

Annual Reports of the Department of Agriculture, 1903 (*U. S. Dept. Agr. Rpts. 1903, pp. 560*).—This includes the report of the Secretary and the reports of

the heads of the different bureaus and divisions. The report of the Secretary, which is also published separately as Report No. 76, has been reviewed editorially (E. S. R., 15, p. 317).

Organization of Department of Agriculture, 1903-4 (*U. S. Dept. Agr., Division of Publications Circ. 1, rev. ed., pp. 23*).

Organization lists of the agricultural colleges and experiment stations in the United States (*U. S. Dept. Agr., Office of Experiment Stations Bul. 137, pp. 100*).

Sixteenth Annual Report of Kansas Station, 1903 (*Kansas Sta. Rpt. 1903, pp. XXIX*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; a report of the council on the staff, publications, and different lines of station work during the year; a subject list of all the bulletins issued by the station; and an index to Bulletins 111-118 issued during the year.

Annual Report of South Dakota Station, 1902 (*South Dakota Sta. Rpt. 1902, pp. 10-23*).—This includes a report of the director and departmental reports covering, in a general way, the work of the station during the year. A financial statement is included.

Annual Report of South Dakota Station, 1903 (*South Dakota Sta. Rpt. 1903, pp. 7-19*).—A report of the work of the station during 1903, similar in character to the report noted above.

Press Bulletins Nos. 71 to 124 (*Kansas Sta. Bul. 119, pp. 86*).—This is the third bulletin of this nature issued by the station, and consists of reprints of press bulletins published during the period from July 1, 1900, to June 30, 1903. The subjects are as follows: Experience in soiling and pasturing cows, 1899; fattening steers without hogs; cultivated blue grasses; some interesting climbers for the veranda; the races of corn; sugar beets in Kansas, 1900; honeysuckles at the Kansas Station; Johnson grass; a digestion experiment with buffalo-grass hay; notes on plums; soy beans in Kansas in 1900; disking alfalfa; clovers; tests of soy beans by Kansas farmers in 1900; roots for Kansas farmers; Kafir corn versus good butter; when to cut alfalfa; condimental stock food for dairy cows; shelled corn compared with corn chop for young calves; dried blood as a tonic for young calves; the clover-hay worm; cowpeas as a second crop; baby beef; three ways of feeding milk to calves; skim milk calves in the feed lot; feeding wheat; inquiries concerning prairie dogs and gophers; feeding farm animals; fall seeding of alfalfa; sorghum pasture for dairy cows; the Hessian fly; maintenance ration for cattle; grain weevils; cattle distemper; sore mouth of cattle; profit in maintaining the milk flow; cerebritis or "staggers" in horses; destroying prairie dogs—a preliminary report; destroying pocket gophers; corn improvement; onion notes; pneumonia in cattle; pasture weeds—their prevention and eradication; whole Kafir corn compared with ground Kafir corn for young calves; contagious sore eyes in cattle; glanders and farcy; ergotism; scab or itch in cattle; poison for prairie dogs and pocket gophers; better-bred grain and corn for Kansas; fistulous withers and poll evil; pasture for hogs; a test of hand separators; and late crops.

Wages of farm labor in the United States, J. H. BLODGETT (*U. S. Dept. Agr., Bureau of Statistics Bul. 26, pp. 62*).—This bulletin adds the results of the twelfth investigation to the results of the previous investigations published in Bulletin 22 of the Division of Statistics (E. S. R., 13, p. 597). This report is similar in character to the one preceding.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 5, Nos. 7, pp. 49-56; 8, pp. 57-60; 8, Sup., pp. 61-68; 9, pp. 69-76*).—These numbers for November and December, 1903, and January, 1904, contain the usual statistical reports on the crops in the United States and foreign countries.

NOTES.

Idaho Station.—G. A. Crosthwait, formerly of the Illinois Station, has been appointed agronomist.

Illinois University and Station.—Three new buildings will be erected in the spring, one for beef cattle costing $25,000, another for horticulture costing approximately $12,500, and a storage building for agronomy costing a similar amount.

Iowa College.—An organization of alumni and ex-students, known as the Iowa Agricultural Union, has been formed with similar aims and purposes to the unions connected with several other agricultural colleges. A pamphlet of 16 pages, outlining experiments in animal husbandry, agronomy, horticulture, and similar lines has been issued. The secretary of the union is G. I. Christie, of Ames.

Kentucky Station.—The following members of the governing board have been appointed by the governor and approved by the State senate: D. F. Frazee, Lexington, to succeed himself; F. A. Hopkins, Prestonburg, to succeed himself; R. L. Stout, Versailles, vice L. N. Lindsay, Frankfort; B. M. Brooks, Slaughtersville, vice W. T. Fowler, Hopkinsville; and Charles Nichols, Lexington, vice R. C. Stoll, Lexington.

Louisiana Stations.—Three assistant chemists have been appointed at the Sugar Station, including J. E. Halligan, formerly connected with the Massachusetts Station.

Missouri University and Station.—C. H. Eckles has been granted a year's leave of absence, beginning in June, and will spend the time abroad in study relating to dairy husbandry.

Nebraska University and Station.—The legislature of 1902–3 appropriated $100,000 for buildings for the agricultural college and experiment station. The February issue of *Agriculture*, published by the students of the college, gives a description of two of these buildings, viz, a horticultural building and a new dairy barn which have been practically completed. Both are located at the university farm. The horticultural building is 40 by 44 ft. and 2 stories in height, with a cellar and 2 greenhouses extending to the south. The first floor contains a large laboratory and the office of the professor of horticulture. The second floor has a large class room and 2 storerooms. One of the greenhouses will be used especially for the germination of seeds, propagation of cuttings, and grafting and potting of plants; the other for growing garden vegetables and small shrubs. The greenhouses and laboratory have cement floors and are heated by steam and lighted by electricity.

For several years the dairy herd has occupied the north wing of the horse barn. The new dairy building now completed—with an appropriation of $10,000—consists of a main part and 2 wings. The main portion is 40 by 80 ft., and 38 ft. high; the 2 wings are 40 and 44 ft. wide, respectively, by 60 ft. long and 28 ft. in height. The first floor of the main portion includes 3 bull stalls, 2 hospital stalls, grain bins, scales for weighing animals, toilet and bathroom, and an office. On the second floor are a seed room, grain bins, and considerable room for storing hay. The wing used for milch cows is well lighted and ventilated, has a cement floor, and is fitted with the Drown iron stall. The other wing is used as a stock-judging pavilion. The barn has a capacity of 77 head, furnishing stall room for 42 milch cows. A silo with a capacity of 120 tons is provided.

Ohio University.—The building occupied by the departments of chemistry, pharmacy, metallurgy, and mining engineering was destroyed by fire the latter part of February, resulting in a total loss estimated at $100,000.

Rhode Island Station.—A. W. Bosworth, first assistant chemist, has resigned.

South Carolina College.—The general assembly has provided 124 scholarships of $100 each for students in the agricultural department of the college. These will be available to students entering next fall. The new agricultural hall will be ready for occupancy in August.

Texas College.—The last session of the State legislature appropriated $50,000 for the purpose of establishing a school of textile engineering, and this sum was turned over to the college. The erection of a textile building was begun in January, and it is expected to be finished early in August. The building will be a model cotton factory, and is designed by one of the best known cotton-mill architects in the country. It is 174 ft. long by 54 ft. wide and 2 stories in height, with a basement under one-third of the building. The walls will be of hard brick. About one-third of the space on each floor will be devoted to offices, class rooms, laboratories, etc., and the remainder to the machinery. The latter will be of the most approved patterns, and will be operated by electricity. Two courses in textile engineering are offered, one of 2 years, intended for practical cotton spinners, and one of 4 years for the regular students, intended to fit them for the details of construction and management of a large cotton and woolen factory. A number of students have already registered for the new courses which promise to be among the most important in the college.

Virginia College and Station.—The State legislature has appropriated $165,000 for buildings, equipment, and improvements. An agricultural building is planned for under this appropriation.

Wisconsin University and Station.—The two weeks farmers' course which began February 5 was successful beyond all expectation. Despite the comparatively short notice and the fact that only persons over 25 years of age were admitted to the course, 166 farmers registered, many of whom were over 50 years of age, and 2 over 60 years old. There were only two lectures of one hour each a day, the remainder of the time being occupied in corn judging, live-stock judging, and demonstrations. Those in attendance showed the keenest appreciation of the instruction, and it is believed that much good will result from the course from the fact that the farmers were brought in touch with the agricultural course and had opportunity to learn of its many possible advantages. W. J. Carson, instructor in dairying and lecturer on dairy chemistry at the Kingston (Ontario) Dairy School, has been elected instructor in dairying at the university, vice U. S. Baer, who has resigned to take the important position of assistant State dairy and food commissioner. Mr. Carson is a practical cheese maker of large experience, and for two seasons has served as traveling dairy instructor in the Province of Ontario. G. N. Knapp, assistant in agricultural engineering, entered upon his college duties March 1.

Wyoming University and Station.—A short course was given at the university from March 1 to 12. The first week was devoted to irrigation matters, and the second to live-stock management and judging. This was the first short course given in the State. A monthly publication has been started under the name of *The Ranchman's Reminder*. The paper is edited by the professor of agriculture and director, and will serve to announce short courses, give items of general interest to ranchmen in the State, and call attention to station publications and other investigations not sufficiently large or complete for bulletins. E. E. Sigman, farm foreman, resigned to take effect in March. It is planned to appoint a head farmer who will look after the general work, and an assistant who will have charge of the notes and records of the station.

Philippine Bureau of Agriculture.—The present organization of the bureau is as follows: F. Lamson-Scribner, chief; W. C. Welborn, assistant chief; H. H. Dell, director of animal industry; H. T. Edwards, fiber expert; William S. Lyon, in charge

of seed and plant introduction; J. M. de Marcaida, assistant to expert in seed and plant introduction; Alfred M. Sanchez, soil physicist; A. J. Washburn, manager of stock farm on the island of Culion; Thomas L. Richmond, superintendent of Malate experiment station; George M. Havice, in charge of San Ramón government farm; James H. Shipley, expert in plant culture, in charge of experiment station work in Batangas; Thomas Hanley, expert in tropical agriculture, in charge of experiments in Benguet Province; C. E. Miles, in charge of rice farm at Murcia, Tarlac Province. The position of director of the agricultural college and experiment station in Western Negros was made vacant at the beginning of the year by the resignation of A. P. Hayne, who has engaged in private work. The botanical work in charge of E. D. Merrill was transferred to the Bureau of Government Laboratories last July. Prof. F. Lamson-Scribner, who organized the Bureau of Agriculture and has been for the past two years its chief, has returned to this country on leave of absence.

New agricultural institutions for India.—Mention was made some months since of an endowment for agricultural work in India which had been given by Mr. Henry Phipps, of Pittsburg. The travel letters of William E. Curtis give a more detailed account of the plan of organization. It appears that Mr. Phipps placed at the disposal of Lord Curzon $100,000, to which he has since added $50,000, to be devoted to whatever object of public utility in the direction of scientific research the viceroy might consider most useful and expedient. The council of state took the subject in hand and have arranged for the organization of an agricultural institution at Pusa, which will include a central research station, a high-grade agricultural college, an experimental farm, and a cattle-breeding farm. Whatever funds are necessary to carry out the project, in addition to Mr. Phipps's donation, will be supplied from the imperial treasury.

A Mr. Coventry, a planter of experience, who came to India in 1880 as manager of a large estate in Southern Bengal, has been selected as director. Other members of the staff are now being selected, and so far as possible natives will be secured to fill these positions. It is proposed to place the agricultural college upon a higher grade than has been reached by any of the agricultural schools in India, the object being not only to provide for the reform of the agricultural methods of the country, but also to furnish a model for and raise the standard of the provincial schools. It is proposed to have a course of 5 years for the training of teachers for other institutions and specialists needed in the various branches of science connected with the agricultural department, who are now usually imported from Europe. For young men who desire only to train themselves for the management of estates a three-years' course will be offered, with practical work upon the farm and in the stable.

The draft horse in action.—The American Museum of Natural History, in New York City, is fitting up an alcove showing the evolution of the horse. This will consist of two series of mounted specimens, the first of fossil horses and of the wild horses, asses, and zebras so far as they can be secured, to show the evolution of the horse in a state of nature; the second of the domesticated horse, showing the modifications of the skeleton as brought about by the artificial selection of man. The three types selected to show the varieties of the domesticated horse are the Percheron, to illustrate the draft horse; the race horse, to show the swiftest form, and the Shetland pony, to show the smallest and least powerful. The expense of preparing the exhibits in this alcove has been borne by the late William C. Whitney, who was a trustee of the museum, and much interested in this subject.

The latest addition to the alcove is the skeleton of a Percheron horse which in life weighed 2,160 pounds, and was 5 feet 6½ inches in height at the withers. The skeleton was mounted by S. H. Chubb, and illustrates the position in drawing a heavy load. Preparatory to the mounting, Mr. Chubb took a large series of photographs of the side, front, and rear views of similar horses hauling heavy loads, in order to ascertain as nearly as possible the position of every part of the skeleton when the

animal is at work. The result, as shown in the mounted skeleton, is considered a complete success, and illustrations of the skeleton from the side and from above and behind, as given in *The American Museum Journal* for January, 1904, are highly interesting. In the side view the exact position of each of the limbs is shown and the flexure of the various joints. The view from above and behind is still more striking, showing the relative position of the parts of the body and the curvature of the backbone as the animal steps. The skeleton of the Shetland pony, showing the animal in the act of grazing, is now in preparation. A mount of a rearing horse held in check by a man is nearly ready for exhibition. The race horse will be mounted as running at full speed.

"The skeleton of an animal is popularly considered its least interesting part; but this method of illustrating its adaptation for special purposes, by representing it in various kinds of action, immediately transforms the skeleton into a subject of the greatest interest. In fact, the wonderful evolution of the horse as it will be shown in the fossil series can only be thoroughly understood when taken in connection with the special motions and actions of the living horse."

Personal Mention.—Dr. E. A. de Schweinitz, in charge of the biochemic laboratory of the Bureau of Animal Industry of this Department, and dean of the medical department of Columbian University, died in Washington February 15, at the age of 38. Dr. de Schweinitz was born at Salem, N. C., and received his education at the universities of North Carolina, Virginia, Berlin, and Göttingen, and also at the Columbian University. He received an appointment in the Bureau of Animal Industry as chemist on January 1, 1890, and was made chief of the biochemic division upon its organization. The investigations for which he is chiefly noted were made in the field of the chemistry and biology of bacteria. He was one of the first to suggest the possibility of the production of immunity toward tuberculosis by inoculation with attenuated cultures of the tubercle bacillus. During the past few years his attention was devoted chiefly to a study of tuberculosis and hog cholera; and his experiments and investigations contributed greatly to the proof of the identity of human and bovine tuberculosis. He also discovered many interesting facts concerning the chemical nature of tubercle bacilli and the changes produced in nutrient media by the growth of these organisms. Dr. de Schweinitz devoted much attention also to the preparation of an efficient antitoxin for the treatment and prevention of hog cholera. Recently his investigations along this line brought to light the existence of a new infectious disease of swine closely related to hog cholera. Dr. de Schweinitz was a member of many American and foreign scientific societies, and was repeatedly chosen as a delegate to international congresses on hygiene, tuberculosis, and medicine.

A. W. Harris, director of The Jacob Tome Institute, has definitely declined the presidency of Boston University.

F. S. Earle, of the New York Botanic Gardens, formerly connected with this Department, has gone to Cuba to consider the offer of an appointment under the Cuban government as chief of agricultural investigations. The development of work in the interest of agriculture in that country, including the establishment of one or more experiment stations, is under consideration.

W. C. Sturgis, formerly botanist at the Connecticut State Station, has been appointed lecturer on botany in Colorado College, at Colorado Springs.

H. S. Grindley, of the University of Illinois, who for several years past has conducted investigations, in cooperation with this Office, on the cooking of meats, has been awarded a second grant of $250 from the Elizabeth Thompson Science Fund to continue his investigations upon the proteids of meats.

A. D. Hall, director of the Rothamsted Experiment Station, delivered a series of three lectures at the Royal Institution in February on Recent Research in Agriculture.

Albert C. Crawford has been appointed expert in pharmacology in the Bureau of Plant Industry, this Department.

George W. Curtis, formerly director of the Texas Station, has been appointed special agent in the Bureau of Plant Industry. He will be connected with demonstration work which is to be carried on upon a large number of private farms under the appropriation for the cotton-boll weevil investigations.

Charles W. Walker, recently connected with the office of the State entomologist of New York, has been appointed assistant in the Division of Entomology, and will take part in the work in Texas against the cotton-boll weevil.

Matthew Steel, of the New Mexico Agricultural College, has been appointed a scientific aid in this Office.

Miscellaneous.—We note from *Science* that the University of Michigan has received from Arthur Hill, of Saginaw, a tract of 80 acres of land near Ann Arbor, to serve as an experiment farm for the forestry department, to be known as the Saginaw Forest Farm. It will provide for an arboretum of all useful forest trees suited to Michigan, demonstration areas for seed-bed and nursery stock, model plantations of forest trees, and special experiments in forestry.

The *American Agriculturist* has begun the publication of a series of articles on the work and results of the experiment stations, with a view to calling attention to the great work which these institutions have been and are doing for the advancement of agriculture and the improvement of farm practice, as well as in contributing to the scientific basis of agriculture.

A $100,000 cassava starch factory is to be built at Lake City, Fla., by a Chicago firm. The citizens of the town provided the site and subscribed for a large block of stock. The mill will have a daily capacity of 120 tons of raw material, and is expected to be a great aid to farmers in the locality by furnishing a market for cassava roots.

The French committee of the International Dairy Association at a meeting in November, 1903, elected M. Legludic honorary president of an international dairy congress to be held in Paris in 1905. The programme of the congress will provide for five sections, as follows: Production of milk; dairy technology (milk, butter, cheese, derivatives, and by-products); dairy hygiene; examination of milk (scientific researches, analyses, adulterations, etc.), and dairy economics (commerce, transportation, and legislation). Declarations of membership, accompanied by a membership fee of 10 francs, should be made to the Comité Français de la Fédération Internationale, 61 Boulevard Barbès, Paris.

The supreme court of New Jersey has issued a mandamus directing the State to pay to Rutgers College the sum of $80,000. This is rendered in connection with the decision of the constitutionality of a law enacted by the State establishing scholarships in the scientific school, which includes the agricultural course. These scholarships have remained unpaid for some time on the contention that the legislative act was unconstitutional.

By the terms of the will of Hudson Hoagland, who died in New York on January 30, the Hampton Normal and Agricultural Institute, of Hampton, Virginia, is to receive a fund of $100,000.

In a recent number of *Gardeners' Chronicle*, it is stated that the new potato Eldorado has been sold at the rate of $1,000 per pound. This potato was recently originated by a large seed firm at Essex, England, and is supposed to be very resistant to certain potato diseases prevalent in England.

The government of New Brunswick, through its Department of Agriculture, is preparing to operate a model orchard in each one of the counties of that province. Apples will be chiefly grown and some plums. These orchards will be located on private farms and cultivated by farmers under the direction of the Department of Agriculture. It appears that this kind of orchard work has been successfully introduced into Nova Scotia, and it is believed that much good to the fruit-growing industry will result from it in New Brunswick.

A new journal of entomology, entitled *Redia*, has recently been established under the editorship of A. Berlese. The journal is published in Portici, Italy, and is designed to include original works on Arthropods, especially on the anatomy, biology, physiology, and classification of insects.

At the jubilee meeting of the Royal Scottish Arboricultural Society, held in Edinburgh last month, a resolution was agreed to, according to a note in *Nature*, expressing the opinion that the Board of Agriculture should now take steps to give effect to the recommendation of the Departmental Committee on Forestry so far as Scotland was concerned, by providing an estate to serve as a state forest demonstration area, and also by providing experimental plats in connection with Edinburgh University. The resolution also expressed the view that education in forestry in that country would not be adequately provided for until these facilities were supplied and a thoroughly equipped forestry school was established in Scotland.

The agricultural college for women founded by Lady Warwick about five years ago, and since conducted at Reading, is reported in *Mark Lane Express* to be about to acquire a new location at Studley Castle, Warwickshire. The new location will afford ample accommodation for 60 students, and suitable rooms for lecture rooms and laboratories. A park of 360 acres surrounds the house, while immediately attached to the castle are large gardens of every description, with a pinetum, orangery, rock garden, and about 600 ft. of glass. The grounds are well suited for poultry keeping; and fruit preserving rooms, laundry, workshop, marketing office, etc., can be fitted up in some of the numerous outbuildings. It is the object of the founder to make the college second to none in the country for the training of women in carrying out the lighter branches of agriculture, such as the production of butter, cheese, poultry, eggs, vegetables, fruit, and flowers.

We note from the London *Times*, through *Science*, that the British Board of Agriculture has asked the governors of the Southeastern Agricultural College at Wye, Kent, to consider a scheme for establishing local field stations for experiments and for providing special courses of training in the processes of agriculture. The board has also suggested the appointment of an instructor in poultry-raising for the counties of Kent and Surrey. A scheme for establishing school gardens throughout the county of Kent is already under consideration. This, it is understood, has the approval of the Board of Agriculture, and no difficulty in obtaining their sanction for the expenditure of the necessary money is anticipated. The technical education funds of the county will bear the cost of the experiment.

Nature states that the Municipal Council of Paris has adopted a proposal of M. Bussat for the foundation of a laboratory of applied physiology. The scheme outlined by M. Bussat for the work to be undertaken in such a laboratory includes studies of the nutritive value of foods, muscular work, intoxication, etc.

It is learned from the same source that a horticultural and gardening exhibition is to be held in June under the auspices of the Royal Botanic Society in the new exhibition grounds of the society in Regents Park, London. The plan of the exhibition includes horticulture, forestry, botany, educational methods, nature study, and colonial products. Arrangements are being made for lectures and conferences to be held in connection with the exhibition.

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EXPERIMENT STATION RECORD.

Vol. XV. April, 1904 No. 8.

The record of respiration experiments abstracted in this issue is a matter worthy of more than passing notice, both on account of the unique character of the apparatus used and the evidence presented of its application in fundamental studies on animal nutrition. It marks a decided advancement in the method and facilities for such investigation, and it may be said to represent the combined result of experience in that important field.

The respiration calorimeter itself, in its present form, is an American product. As is generally known, the Armsby-Fries apparatus follows the Atwater-Rosa apparatus for experiments with man in its main features of construction. In adapting the latter to experiments with large animals, however, it was necessary not only to increase the size of the respiration chamber but to introduce a considerable number of special features, so that the operations of feeding, weighing, collecting the excreta, etc., could be performed from without. The cooperation of the subject within the chamber could not be counted on, as in the case of experiments with man. Among the most interesting of these special features are the devices for weighing the heat absorbers from the outside, the air lock for introducing feed and water without allowing the air in the respiration chamber to escape, and similar devices for the collection of the liquid and solid excretory products. As shown by the results of check experiments, the apparatus is very accurate, the measured heat being practically identical with the theoretical amount produced by burning alcohol in the respiration chamber.

In ordinary metabolism experiments the amounts and composition of the food and of the urine and feces are the factors considered. Using this apparatus the amount and composition of the respiratory products, the fuel value of the food, and the energy output of the body are also ascertained, and it is possible to determine the total income and outgo of both matter and energy. The sufficiency of the ration and its digestibility are thus necessarily brought into account, while the other data recorded make it possible to judge of the changes going on in the body much more satisfactorily than by any method hitherto available.

These things make the apparatus specially adapted to studies of such questions as the energy required to digest and assimilate different classes of feeding stuffs. It is obvious that more energy will be used up in assimilating the nutritive material from a feed like timothy hay, containing relatively large amounts of crude fiber and woody substances, than from a concentrated feed like corn meal, and that this factor will affect the net value of the feed for the nutrition of the animal. Such differences are not taken account of in ordinary studies of the composition and digestibility of feeds. Hitherto they have been studied very largely by Zuntz's method of observing the variations in the respiratory quotient; that is, the ratio of oxygen consumed to the carbon dioxid excreted. Dr. Armsby's apparatus furnishes another way of approaching such problems and one in which it is possible to control the experimental conditions and judge of the changes going on in the body more accurately.

That the first series of experiments with this apparatus should have given results of so much interest, both in their scientific aspects and from a practical standpoint, is especially gratifying. The conclusion reached that a maintenance ration is not a constant quantity, but a variable one depending upon the kind of food used, is of fundamental importance, as are also the closely related deductions which have to do with the replacing value of nutrients. There is indication that Rubner's law regarding the replacing value of nutrients, which has been held for so many years, is subject to certain limitations and will need modification in the light of the energy requirements for digestion and assimilation. Indeed, Rubner's original conception in regard to this matter has been considerably modified in his recent book.

The apparatus affords an opportunity for following up a great variety of important lines of investigation and for checking the results secured by the more practical methods of feeding experiments. The difference found in the above experiment between the energy used up by the animal when standing and when lying down suggests the importance of reducing muscular activity to a minimum during the fattening period. Furthermore, the fact that on a maintenance ration and when closely confined the steer produced more heat than was required to maintain the body temperature has a bearing on the contested point as to whether steers should be fattened out of doors or in stables in cold weather. It seems evident from Dr. Armsby's data that steers on heavy or fattening rations are really developing an excess of heat, and hence would not need to draw upon their food for any increased supply when fed out of doors. This supports and explains Waters's conclusions of several years ago. Some of the observations already made also have a decided bearing on the problem of stable hygiene and ventilation; and, in a word, it is true of this as of the Atwater-Rosa apparatus that the possible lines of investigation range from the most practical to the most technical subjects.

The development and operation of this apparatus is one of those large undertakings which belong appropriately to the General Government to foster. It is a necessarily expensive line of research and requires a corps of specially trained men. Few of the individual experiment stations are in position to enter upon it, but all can profit alike by its findings, wherever they are made, for in general they are of as much interest and application in Maine as in California. It is a matter for congratulation, therefore, that the National Department of Agriculture, through its Bureau of Animal Industry, has seen fit to contribute its funds to the development and subsequent operation of this apparatus, and it is earnestly to be hoped that no lack of public funds will prevent the continuation of this cooperation on a liberal basis.

Rural economics as a subject of undergraduate study has received comparatively little attention in American agricultural colleges. Some phases of the subject, such as the history of agriculture, farm management, and farm law, have been taught from time to time, but as yet there has been no adequate provision for well-rounded courses in rural economy in any of the agricultural colleges. Attention was called to this subject in the fifth report of the committee on methods of teaching agriculture in 1900, and a tentative course in rural economics was outlined.[a] Since then the faculties of our agricultural colleges have manifested a somewhat greater interest in the subject, with the result that a few institutions have begun to develop definite courses of instruction along these lines.

The College of Agriculture of the Ohio State University includes in its faculty a professor of rural economy, and offers a course on the history of agriculture and rural economics consisting of "lectures and recitations upon the history of agriculture, agricultural methods in various countries, cost and relative profits, and various farm operations and systems." A course in "agricultural economics" at the College of Agriculture of the University of Minnesota includes farm management, systems of farming, planning farms, field crops, stock, labor, finances, soils, prices, agricultural statistics, production, exports, wages, land laws, ownership, taxes, and organizations. In the reorganized programme for courses of instruction in the College of Agriculture of Cornell University rural economy is given as one of the main branches of agriculture, and courses are offered in farm accounting and the economics and history of agriculture. Special attention is given to this subject at the Rhode Island College, where courses in farm management and rural economics are offered.

At the University of Wisconsin the instructor in commerce gives a course in agricultural economics which "treats of those principles

[a] U. S. Dept. of Agr., Office of Experiment Stations Bul. 99, p. 91.

which underlie the prosperity of the farmer and of all other classes in so far as they are dependent upon agriculture. The subject is divided into two parts. Part one considers the point of view of the farmer and those economic principles which underlie the management of a farm in such a manner as will make it yield the largest net return. Part two discusses the point of view of the nation as a whole and those principles which should guide the statesman in his efforts to regulate and improve the agriculture of the country."

The annual report of this Office, now in press, contains an article on Agricultural Economics as a Subject of Study in the Agricultural College, with a syllabus of a college course. The article is by President K. L. Butterfield, of Rhode Island, who has made this subject one of special study for some time.

President Butterfield takes the ground that the course in rural economy should be something more than the study of farm management: that "farm management discusses the aspects of agriculture as a business and approaches agriculture from the standpoint of the individual farmer, while agriculture is something more than a business; it is an industry. And because agriculture is an industry, and indeed ranks among the leading industries, it is related to all other industries and must be considered in those relations. It is not an isolated occupation. It is subject to economic laws. It prospers or lags, not merely because of its internal phases, so to speak, but also because of its external relations. It should therefore be studied as an industry as well as an art and a business and approached from an economic standpoint." Agricultural economics "is a discussion of agriculture in the light of the principles of political economy."

With this provisional definition in mind, President Butterfield outlines a short lecture course in agricultural economics under the following general heads: (1) Characteristics of the agricultural industry; (2) History of the agricultural industry; (3) Present status of the farming industry; (4) The agricultural market; (5) Business cooperation in agriculture; (6) Agriculture and legislation; and (7) Some current problems—agricultural labor, machinery and agriculture, interest (rates, indebtedness, etc.), tenant farming, business methods, immigration and agriculture.

The recent action of the Carnegie Institution in establishing a department of economics and sociology in charge of Carroll D. Wright is of interest in this connection. This department has undertaken the preparation of an economic history of the United States, embracing eleven subjects. The second of these subjects, concerning the history and status of the economic and social relations of agriculture in the United States, has been assigned to President Butterfield, who is planning to bring to his aid a number of experts in different branches of agriculture. Owing to the scarcity of available

material which has been put into pedagogical form, those interested in the development of courses in rural economy in our agricultural colleges will await the appearance of reports from President Butterfield and his collaborators with interest.

In European countries much more attention has been given to the formulation of courses in rural economy than in the United States. According to a somewhat detailed outline of the subject as taught in a number of the principal countries of Europe, which is included in a review of progress in agricultural education in the forthcoming report of this Office, some of the agricultural institutions of Germany have been conducting such courses for thirty or more years, and practically all of the agricultural institutions of France, from the Institute Nationale Agronomique down to the grammar schools, give attention to rural economics.

In the higher agricultural schools of France the lectures on rural economy include the elements of political economy, rural economy, and agricultural legislation. Political economy as taught in this course comprises a consideration of the production, circulation, distribution, and consumption of wealth. Rural economy includes the study of the character and history of the subject, as preliminary to a more detailed consideration of the production, circulation, distribution, and consumption of agricultural wealth, and of credit and agricultural accounts. The lectures on rural legislation present a study of civil, administrative, and commercial laws, together with other legislation of agricultural interest. The class work is supplemented by excursions to different estates for the purpose of inspecting and studying their management.

Prof. Étienne Jouzier, of the National School of Agriculture at Rennes, has recently contributed to the Encyclopédie Agricole a text-book on Économie Rurale, which constitutes one of the first pedagogical treatises on this subject that has come to our attention. After giving consideration to the place that rural economy should occupy among agricultural sciences and defining the subject, Professor Jouzier takes up the consideration of social environment or external factors, such as population, the State, associations, charitable institutions, and exports. This is followed by chapters on elements of production, or internal factors, including capital, labor, and land, and on credit, vegetable production, animal production, and cultural methods. Finally a few pages are devoted to comparative economics and the organization and management of an enterprise.

This little volume is especially valuable because it embodies the experience which has been had in teaching this subject abroad, and particularly in France where it has been brought into pedagogical form.

The outline followed in the higher institutions of France serves also

in the practical schools of agriculture, but the work is naturally more elementary. In such of the grammar schools as include courses in agriculture some consideration is given to divisions of the land, societies and meetings, large, medium, and small farms, methods of farm management, agricultural credit, agricultural institutions and organizations, and the distribution of agricultural products.

In some of the Belgian agricultural institutions social, political, and rural economy were formerly taught as one subject, but at present rural economy is considered as a separate branch. At the Agricultural Institute at Gembloux lectures on rural economy are given during the third year of the college course, and include consideration of factors instrumental in agricultural production, the soil, capital, labor, elements necessary or favorable to production, plant production, animal production, and agricultural technology. The lectures are supplemented by practicums devoted to exercises in estimating land values, capital required for running expenses, quantities of feed consumed, management of the farm, and labor requirements.

In the agricultural institutions of Great Britain some attention is given to courses in rural economy, but these are far from uniform. In many cases the courses are nothing more than lectures on farm management. However, some attention is given to the consideration of broader subjects, such as the food supply of the United Kingdom, foreign competition, effects of appreciation of gold and depreciation of silver, and the laws of landed estates.

In Austria courses in rural economy are preceded by courses in civil government, political economy, political economy applied to agricultural statistics, and labor and social reform. The subject of rural economy is taught in the course in agronomy and includes the consideration of such factors of agricultural production as the soil, capital, labor, methods of management, organization of an agricultural estate, and taxation.

The Royal Agricultural High School in Berlin teaches rural economy by means of lectures in the class room and by deliberations and discussions in the economic seminar. This seminar was organized in 1889, and has grown steadily in its influence and numerical strength, its membership comprising both undergraduate and graduate students, as well as persons making special investigations in political economy, philosophy, history, and other subjects. Each student is required to write a dissertation on some subject, usually of his own choice, and to lecture on the same before the seminar, after which the subject is thoroughly discussed by the other members. This work is supplemented by excursions to institutions possessing economic, social, and political interest.

In nearly all of the German universities courses in rural economy are maintained. These vary considerably, but in general include lectures on the elements of political economy, and on capital, labor, land, and farm management, together with some instruction in rural legislation. At Göttingen these lectures were started in 1875, and at Hohenheim in 1873. In some of the agricultural winter schools also lectures on economics are given, which include such subjects as agricultural societies, factors affecting agricultural pursuits, cost of agricultural production, systems of farming, crop rotations, and agricultural law.

This is far from being an exhaustive review of the present status of instruction in rural economy, but it is sufficient to show that with respect to this branch of the science of agriculture the agricultural institutions of Europe are far ahead of our own, both in the extent of the instruction given and in the definite formulation of courses. In the United States scarce a half dozen of our leading agricultural colleges offer courses in rural economy, while in Europe not only do the agricultural colleges quite generally give attention to this subject, but many of the secondary and primary agricultural schools also include it in their curricula. In general, the subject is considered quite broadly, not alone as farm management from the point of view of the individual farmer, but also as a branch of economic science, in which the external factors related to agriculture as an industry are viewed from the standpoint of the economist.

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SUBJECT LIST OF ABSTRACTS.

CHEMISTRY.

The determination of citric-acid soluble phosphoric acid in Thomas slag, O. Böttcher (*Chem. Ztg., 27 (1903), No. 100, p. 1225*).—A method of testing the citric acid extract of Thomas slag for silicic acid is described as follows: To 100 cc. of the extract in a 200 cc. flask add 75 cc. of ammoniacal citrate solution, boil over the direct flame, and allow to stand for 5 to 10 minutes. If no precipitate soluble in hydrochloric acid separates out, silicic acid is not present in sufficient amount to interfere with the accuracy of the determination, and phosphoric acid may be determined directly in 50 cc. of the extract. If a flocculent precipitate of silicic acid is formed the solution is acidified with dilute hydrochloric acid, cooled, and filtered. To 100 cc. of the filtrate 20 cc. of magnesia mixture is added, the mixture shaken one-half hour, and the operation continued in the usual way.

The inapplicability of the so-called Maercker-Bühring solution to the determination of total phosphoric acid in Thomas slag, H. Svoboda (*Chem. Ztg., 27 (1903), No. 98, pp. 1203–1205*).—Comparative tests of the Maercker-Bühring solution (1,500 gm. of citric acid and 5 liters of ammonia of 0.91 sp. gr. made to a volume of 15 liters) with the old method of separate addition of citric acid and ammonia are reported. The results by the new method were as a rule higher than those by the old. This is attributed to the presence in the precipitate of silicic acid dissolved from the glass vessels in which the solution was kept.

A table for the calculation of phosphoric acid from magnesium pyrophosphate, T. Kämpfer (*Ztschr. Analyt. Chem., 43 (1904), No. 1, App., pp. 25*).

The organic matter in soils and subsoils, F. K. Cameron and J. F. Breazeale (*Jour. Amer. Chem. Soc., 26 (1904), No 1, pp. 29–45*).—Of the 3 methods in common use for the determination of organic matter in soils, those based on loss on ignition and humus content are condemned as unsatisfactory, and the third or combustion method, which consists in burning the organic matter either in a tube in a furnace or by powerful oxidizing agents, such as chromic acid or potassium permanganate, and collecting and determining the carbon dioxid liberated, is considered most accurate and reliable.

In the method recommended "a sample of the soil, usually about 10 gm., is carefully weighed and brought into the combustion flask. If the sample be rich in organic matter, it has been found advisable to introduce also some sand, previously ignited before the blast, and in an amount dependent roughly upon the apparent quantity of organic matter in the soil. From 5 to 10 gm. of pulverized potassium bicromate are then added, and the whole mixed thoroughly by shaking, care being taken to prevent any of the mixture adhering to the sides of the flask above the level of the mixture. The flask is closed securely by the stopper, and a gentle stream of air drawn through the whole apparatus by means of the aspirator.

"When this stream of air has been passing for about 10 minutes, concentrated sulphuric acid (sp. gr. about 1.83) is slowly and cautiously run in by means of the

dropping funnel until the tip of the glass tube, for the introduction of air, is covered. When this point has been reached, and if no very vigorous action is taking place, the combination flask is slowly heated until the sulphuric acid commences to give off fumes. It is held at this temperature for from 5 to 10 minutes, and then allowed to cool slowly, unless there is reason to believe combustion has not been complete, in which case the temperature is again raised. Care must be exercised to see that a steady current of air be kept passing through the apparatus, and that the mixture in the flask be not forced back toward the wash-bottles."

In case of soils containing chlorids this method of procedure may result in the generation of chlorin gas, which will vitiate the results. This, it is claimed, may be obviated by dissolving the potassium bichromate in the concentrated sulphuric acid and slowly and cautiously running the solution in upon the soil with no attempt to heat the mixture until the reaction in the flask has proceeded for some time. By proceeding in this manner "no hydrochloric acid, chlorin, nor chromyl chlorid gas is generated, or in but very small amounts. The procedure thus modified has been used a large number of times with artificial mixtures and natural soils, and has proved satisfactory, although no explanation is obvious why hydrochloric acid should not be formed and oxidized under these conditions." The method is claimed to be fairly rapid, a combustion requiring on the average about 40 minutes.

As a result of a large number of determinations, it is stated that the organic matter in a subsoil rarely equals or exceeds that contained in the corresponding soil. "The facts presented here would suggest that the humus determination is of even more uncertain value than is usually believed. There is not sufficient ground as yet for advocating the use of any other factor than the usually accepted one [0.471] for the calculation of the organic matter from the carbon dioxid obtained in the combustion."

A number of determinations are reported which show an average of 42 per cent of carbon in humus instead of 56 per cent, as reported by other investigators.

On the determination of assimilable plant food by extraction of soils with very dilute acids, H. G. Söderbaum (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), pp. 103–106; abs. in Centbl. Agr. Chem., 32 (1903), No. 12, pp. 795–798*).—This is an account of pot experiments during 1900 and 1901 with barley growing on loam and humus soils which had been extracted for 48 hours at ordinary temperatures with 2 per cent hydrochloric acid. The extracted soils without addition of any fertilizing material proved practically sterile. The application of lime as carbonate, however, resulted in a partial restoration of the productive capacity, and with applications of lime and 2 of the essential fertilizing constituents (either potash or phosphoric acid) the yield was very little less than that on unextracted soil. Apparently assimilable nitrogen was the element most completely removed by the extraction, but in no case did the treatment remove all of the assimilable plant food present in the soil.

A contribution to soil analysis, O. Förster (*Chem. Ztg., 28 (1904), No. 4, pp. 36–38*).—A method of procedure is described which is intended to obviate as far as possible the difficulties encountered in securing complete removal of solution from the insoluble residue of acid digestion, and also the separation of potassium and alkaline earths from the voluminous iron and alumina precipitates.

The solution is prepared by treating 100 to 200 gm. of the air-dry soil for 3 hours on a water bath with 10 per cent hydrochloric acid at the rate of 2 cc. of acid to each gram of soil. The solution after cooling is diluted with water at the rate of 1,000 cc. for each 100 gm. of soil, and an aliquot part of the solution is evaporated to dryness with 5 to 10 cc. of nitric acid to remove silicic acid. The residue is taken up in dilute hydrochloric acid and the solution diluted to such a volume that each 100 cc. corresponds to 40 to 50 gm. of soil. Aliquots corresponding to from 20 to 50 gm. of soil are used for the determination of phosphoric acid, potash, lime, and magnesia by methods which are described in detail.

Methods of physical and chemical soil analysis, E. W. HILGARD (*California Sta. Circ. 6, pp. 23, fig. 1*).—A revision of methods given in Bulletin 38 of the Bureau of Chemistry of this Department (E. S. R., 5, p. 510), reprinted for the use of students in the college of agriculture of the University of California.

A rapid gravimetric method of estimating lime, F. B. GUTHRIE and C. R. BARKER (*Jour. and Proc. Roy. Soc. New South Wales, 36 (1902), pp. 132-134*).—In order to secure complete and rapid oxidation of the calcium oxalate precipitate it is recommended that it be mixed with ammonium nitrate before ignition.

On the determination of calcium in the form of oxalate, J. VAN DORMAEL (*Rev. Gén. Agron.* [*Louvain*], *12 (1903), No. 11, pp. 495, 496*).—Experimental data are reported which indicate that the method proposed by Paguiref (E. S. R., 14, p. 737) does not possess any advantage as regards accuracy over the ordinary method of determination and is slower.

Some recent methods of technical water analysis, H. R. PROCTER (*Jour. Soc. Chem. Ind., 23 (1904), No. 1, pp. 8-11*).—A brief review of the progress of investigation along this line, showing the advantages from a technical standpoint of the more exact methods of titration, such as those proposed by Hehner and Pfeiffer and Wartha, over the old soap solution method. The author describes these methods, calling attention especially to some of the sources of error in working with such dilute solutions as most waters present and suggesting means of avoiding errors.

The separation and determination of iron and phosphoric acid in waters, H. CAUSSE (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 18, pp. 708-710; Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 24, p. 1229*).—The author recommends that the iron and phosphoric acid be precipitated in 2 to 3 liters of the filtered water by the addition of 0.6 to 0.8 gm. per liter of chloromercurate of sodium p-amidobenzinsulphonate, the precipitate being allowed to settle for 24 to 36 hours, collected on a filter, and dissolved in hydrochloric acid. The hydrochloric acid solution is evaporated to dryness and the residue fused with pure sodium carbonate. The fusion is moistened with nitric acid, dried, and calcined. On treatment with water the phosphoric acid is dissolved and the iron is left as oxid, which may be collected on a filter.

The direct estimation of free carbonic acid in natural waters, A. McGILL (*Jour. Amer. Chem. Soc., 26 (1904), No. 2, pp. 183-186*).—The apparatus used by the author for this purpose is described.

The determination of hardness in waters, P. DRAWE (*Chem. Ztg., 27 (1903), No. 99, p. 1219*).—This is a discussion of results obtained by means of Pfeiffer's modification of Wartha's method[a] on alkaline waters, in which the temporary hardness was occasionally greater than the permanent hardness. The author ascribes the permanent alkalinity observed in such waters after boiling to sodium carbonate and not to magnesium carbonate as Pfeiffer claims.

In the Pfeiffer-Wartha method temporary hardness is determined by titration with tenth-normal hydrochloric acid, using alizarin as indicator and completing the titration in boiling solution in a Jena flask. The permanent hardness is determined by adding an excess of a tenth-normal mixture of sodium hydroxid and carbonates, boiling and partially evaporating in a Jena flask, allowing to cool and settle, or filtering, and titrating the excess of alkali solution with tenth-normal hydrochloric acid in an aliquot part of the solution, using alizarin as indicator. Pfeiffer employs the water which has been used for the determination of temporary hardness instead of the original water.

Determination of hardness in waters, E. BASCH (*Chem. Ztg., 28 (1904), No. 3, p. 31*).—A brief discussion of recent investigations on this subject, including a reference to the article by Drawe noted above. Results of examinations by the author

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[a] Ztschr. Angew. Chem., 15 (1902), p. 198.

of two waters are reported. These bear out Drawe's conclusion that the alkalinity after boiling is due entirely to sodium carbonate, but they also indicate that magnesium carbonate remains in solution, the latter carbonate presenting a neutral reaction.

The determination of hardness in waters, F. AUERBACH (*Chem. Ztg., 28 (1904), No. 2, p. 16*).—Referring to a previous article by Drawe, the author questions whether the permanent alkalinity is not in part at least due to magnesium carbonate as first pointed out by Pfeiffer.

Modifications of the Pelouze-Fresenius method of determining nitric acid, L. DEBOURDEAUX (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 1, pp. 1–3*).—In the modification proposed the Fresenius apparatus is used with the addition of a cooling device to prevent loss of nitric acid. The air is driven from the flask containing the nitrate by means of carbon dioxid. The ferrous solution is introduced through the tube carrying the gas by means of a 100 cc. pipette, care being taken to do this and to heat the solution so that a regular evolution of gas occurs. After washing the tubes with boiled distilled water the excess of ferrous chlorid in the solution is titrated with potassium permanganate.

On a new volumetric method of determining nitric acid, L. DEBOURDEAUX (*Bul. Soc. Chim. Paris, 3. ser., 31 (1904), No. 1, pp. 3–6*).—Previously noted from another source (E. S. R., 15, p. 224).

On the dissociation of alkaline carbonates, P. LEBEAU (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 26, pp. 1255–1257*).

Composition of commercial alkalis ("concentrated lye"), G. E. COLBY (*California Sta. Rpt. 1902–3, p. 92*).—The sodium hydroxid in 5 samples of soda lyes examined was respectively 97.6, 92.2, 87.5, 82.4, and 68.5 per cent. The potassium hydroxid in 2 samples of potash lyes was respectively 71.4 and 69.1 per cent.

The conversion of calcium oxalate to the sulphate, A. N. CLARK (*Jour. Amer. Chem. Soc., 26 (1904), No. 1, pp. 110, 111*).—In the method proposed the platinum crucible containing the oxalate saturated as usual with sulphuric acid is partially embedded in asbestos or calcium sulphate contained in a porcelain crucible about ½ in. larger in diameter than the platinum crucible. "The top portion of the platinum crucible is heated first and remains hotter than the bottom so that the excess of sulphuric acid boils out from the top of the precipitate, instead of from the bottom. The excess of acid is driven off in about one minute; the platinum crucible is then removed from the porcelain crucible and set over the flame until it is brought to a red heat."

The determination of alkalis, especially in plant substances, H. NEUBAUER (*Ztschr. Analyt. Chem., 43 (1904), No. 1, pp. 14–36*).—To the coarsely ground material add a mixture of nitric acid of 1.4 sp. gr. and concentrated sulphuric acid (30 cc. of nitric acid for 5 gm. of seeds, 40 cc. for 5 gm. other materials) and allow to stand 1 hour without heating. Then apply heat cautiously and digest until the solution becomes almost colorless. Allow to cool slightly, add about ½ cc. of concentrated nitric acid, and heat again. Repeat the treatment with nitric acid to complete the oxidation. Cool, add at least an equal volume of water, and warm to expel nitrous fumes. Evaporate to dryness in a platinum dish and heat to redness. Take up in warm water acidified with hydrochloric acid and evaporate to dryness to expel hydrochloric acid. Add phenolphthalein and freshly prepared milk of lime until a saturated solution of calcium hydroxid (shown by a strong red color) is obtained. Make to definite volume (125 cc. for example), mix, allow to stand ½ hour, and filter.

In an aliquot of the filtrate precipitate lime by adding first oxalic acid and then ammonia, taking special care to secure neutrality and complete precipitation without a great excess of ammonium oxalate. Filter through a small filter into a platinum dish, wash with cold water containing a little ammonium oxalate, evaporate to dryness, and drive off ammonium compounds. Take up in hot water, add ammonia,

and again evaporate to dryness. To insure conversion of bisulphates which may be present add ammonium carbonate and heat to redness, repeating this operation until a constant weight is obtained. This gives the sum of the weights of the sodium and potassium sulphates plus a small error due to magnesium sulphate.

The sulphates are dissolved in dilute hydrochloric acid and the potash determined by the author's method already described (E. S. R., 14, p. 631).

Determine magnesia by precipitation with sodium phosphate and ammonia in the hot alcoholic filtrate from the potassium-platinum chlorid, dissolving the precipitate in hot dilute hydrochloric acid and evaporating to dryness, and heating slowly with sodium carbonate until the dish glows. Take up in water and hydrochloric acid and determine magnesia in the usual way, using the results to correct the combined weights of potassium and sodium sulphate.

Coal ash, J. W. Cobb (*Jour. Soc. Chem. Ind., 23 (1904), No. 1, pp. 11–13, fig. 1*).—Methods of determining the ash in coal and of analyzing the ash are discussed.

Concerning fats, A. Partheil and F. Ferié (*Arch. Pharm., 241 (1903), Nos. 7, pp. 545–560; 8, pp. 561–569, figs. 2, dgms. 2*).—The author studied especially lithium salts of some of the higher fatty acids, and a method of separating these acids by means of their lithium salts is proposed. This depends on the fact that stearic and palmitic acid are precipitated quantitatively by lithium acetate, and myristic acid very nearly so, and with the aid of this reagent these acids may be separated from lauric and oleic acids. Experiments are also reported on the estimation of acids of the linoleic series and their separation from oleic acid by means of barium salts. The method of procedure in fat analysis is outlined and results are reported of analyses of butter, lard, and human fat.

Concerning the constituents of unripe St. John's bread, L. Rosenthaler (*Arch. Pharm., 241 (1903), No. 8, p. 616*).—A brief note on the material obtained by extracting the fruit of St. John's bread (*Ceratonia siliqua*) with boiling alcohol.

The analysis of hexon bases, A. Kossel and A. J. Patten (*Ztschr. Physiol. Chem., 38 (1903), No. 1–2, pp. 39–45*).—A modified method of estimating histidin is recommended, which depends on the fact that this body is completely precipitated by mercury sulphate even in the presence of a certain amount of free sulphuric acid. With the help of this reagent the authors found that it was possible to separate histidin, aspartic acid, and other monoamido acids. For the separation of histidin and arginin Kossel and Kutscher's method is considered the best, the mercury sulphate being used to purify the histidin after it is separated from the arginin as a silver compound. By using modified methods, the authors determined the hexon bases in crystallized edistin.

The chemistry of wheat gluten, G. G. Nasmith (*Trans. Canad. Inst., 7 (1903); Univ. Toronto Studies, Physiol. Ser. (1903), No. 4, pp. 22*).—The work of other investigators on the nitrogenous constituents of wheat is critically discussed and the results of a number of experiments reported. According to the author, "gliadin and glutenin do not come from the same parent substance, nor are they of the same composition. Gliadin has not a definite coagulation point, while glutenin has. Gliadin is obtained from rye, barley, and maize, and from the bran and shorts of wheat, while glutenin can not be obtained from these. By chemical or other means one has as yet not been transformed into anything at all resembling the other.

"The substance between the aleurone grains seems to be chiefly gliadin, and contains inorganic iron, calcium salts, and phosphorous-holding compounds.

"Gliadin is distributed throughout the endosperm, especially toward the periphery, where the small proteid granules are much thicker and the starch granules they inclose smaller. It is also contained in bran, and probably in aleurone cells as part of the packing between the aleurone grains, for both bran and shorts yield gliadin to dilute alcohol."

The author found that gliadin was precipitated with an excess of acid and is of the

opinion that this property has not been hitherto noted. He states further that it is not entirely insoluble in dilute salt solutions.

"Both gliadin and glutenin invariably give the reactions for organic iron and phosphorus, but are not nucleo-proteids. Under the microscope the gluten matrix in thin sections of wheat does not show any indication of iron or phosphorus, and it must, therefore, be concluded that the organic iron and phosphorus found in gluten are due to nucleins or nucleic acid derived from the nuclei of the large endosperm cells. Probably part is derived from nuclei of the aleurone cells, or of the embryo cells, or from the nucleins present in the cytoplasm of the embryo cells.

"With the exception of the rapidly dividing cells such as those of the radicle and plumule, iron is found in the nuclei only of the various cells of the wheat grain.

"Phosphorus is more widely distributed, appearing between the aleurone grains; in fine grains in the radicle and plumule cells; in the foam-like mesh work of another type of embryo cell; in the very distinct large granules just described, and in the nuclei of all these cells. From the various ways in which these different cells stain and the several methods of phosphorus distribution in them, one may conclude that there are probably several nucleins present.

"Gliadin exists as such in the wheat grain, and the theory of its formation by means of ferment action is not justifiable. Strong alcohol mixed with flour and then diluted with water to a 70 per cent solution extracts gliadin from it; boiling alcohol also extracts gliadin from flour or bran.

"Glutenin exists as such in the wheat grain; any manipulation that will destroy the hypothetical ferment will coagulate glutenin, thus making gluten formation impossible.

"Gluten formation is not merely a mechanical mixture of gliadin with glutenin, but a definite physical state of the two mixing substances is necessary. Coagulated glutenin with gliadin does not form gluten.

"There are probably several nucleins or nucleo-proteids in wheat as shown in the various ways phosphorus is distributed in the different types of embryo cells. Organic iron is found only in the nuclei of the endosperm, aleurone, and embryo cells, and in the cytoplasm of the absorption layer, plumule and radicle cells. The proteid between the aleurone grains shows the presence of organic phosphorus only."

A bibliography of the subject is appended.

Proteids: A contribution to the subject, II, F. Kutscher (*Ztschr. Physiol. Chem., 38 (1903), No. 1–2, pp. 111–134*).—With a view to securing data regarding the structure of proteids, the author studied the cleavage products of gluten casein, gluten fibrin, gliadin, mucedin, zein, and thymushiston, the cleavage being induced by heating with dilute sulphuric acid. The method of separating the different cleavage products is described and the results reported in detail. The following table summarizes the percentage amount of different cleavage products found:

Cleavage products of a number of proteids.

Kind of proteid.	Ammonia.	Histidin.	Arginin.	Lysin.	Tyrosin.	Glutamic acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Gluten casein	2.64	1.56	4.54	2.0	2.75	9.00
Gluten fibrin	3.89	1.53	3.05		4.43	13.07
Gliadin	4.10	1.20	2.75		2.09	18.54
Mucedin	4.23	.44	3.13		2.35	19.81
Zein	2.56	.81	1.82		10.06	10.00
Thymushiston	1.66	1.21	14.36	7.7	6.31	3.66

The results obtained with the first 4 proteids included in the table are discussed with special reference to the composition of wheat gluten. Gliadin and mucedin are regarded as identical, and the author proposes that they be grouped together under

the name gliadin. Wheat gluten he considers to be made up, therefore, of 3 distinct proteids well characterized by their cleavage products, namely, gluten casein, insoluble in alcohol; gluten fibrin, slightly soluble in cold 60° alcohol; and gliadin, readily soluble in this reagent.

Concerning the precipitation of pure glycogen, Z. Gatin-Gružewska (*Arch. Physiol.* [*Pflüger*], *100* (*1903*), *No. 11–12, pp. 634, 635*).—A preliminary communication in which the author notes that pure glycogen prepared from horseflesh is precipitated by alcohol from an aqueous solution in two different forms, viz, spheres and rods. The character of the precipitate, in his opinion, affords a means of judging of the purity of the glycogen.

On a new product of the autodigestion of pancreas, F. Baum (*Beitr. Chem. Physiol. u. Pathol.*, *3* (*1903*), *pp. 439–441; abs. in Bul. Soc. Chim. Paris, 3. ser.*, *30* (*1903*), *No. 23, p. 1289*).—The autodigestion of pancreas was continued from 5 to 6 weeks at a temperature of 37° C. A new product was isolated, for which the author proposes the name "scatosine" because of its probable relations to skatol.

New studies on scatosine, R. E. Swain (*Beitr. Chem. Physiol. u. Pathol.*, *3* (*1903*), *pp. 442–445; abs. in Bul. Soc. Chim. Paris, 3. ser.*, *30* (*1903*), *No. 23, p. 1289*).—A chemical study of the scatosine mentioned above.

Loss of nitrogen from urine by evaporation, Bürki (*Schweiz. Landw. Ztschr.*, *31* (*1903*), *No. 39, p. 938; abs. in Centbl. Agr. Chem.*, *32* (*1903*), *No. 12, p. 846*).—In evaporating to dryness the nitrogen of a sample of urine declined from about 0.8 per cent to 0.08 per cent.

Further notes on the phosphorous constitutent of plant seeds, E. Schulze and E. Winterstein (*Ztschr. Physiol. Chem.*, *40* (*1903*), *No. 1–2, pp. 120–122*).—A chemical study of a phosphorous body in the seeds of *Sinapis nigra*.

Concerning the lecithins prepared from plants, I, E. Schulze and E. Winterstein (*Ztschr. Physiol. Chem.*, *40* (*1903*), *No. 1–2, pp. 101–119*).—The authors prepared and studied lecithin from lupines and from vetch, paying especial attention to the portion of the lecithin which is difficultly soluble in alcohol.

Investigation of the seeds of Polygala apopetala, E. W. Hilgard (*California Sta. Rpt. 1902–3, pp. 102, 103*).—The possibility of using for oil-making the seeds of *Polygala apopetala*, which is a native of the lower region of California, is discussed, and analyses (by G. E. Colby) of seed and partial analyses of the roots are reported. The seeds were found to contain over 56 per cent of oil, which when extracted by ether was found to have a strong flavor of saponin. The cold-pressed oil was of a lighter color than olive oil. When washed with water, dried with calcium chlorid, and filtered, the taste of saponin disappeared and the oil was bland. Comparative tests showed that the oil is more liquid and less drying than olive oil.

The author does not regard it probable that *P. apopetala* can be grown with profit as an oil-producing plant unless the oil is found to possess some special merits or have uses not now known.

Miscellaneous analyses, G. E. Colby (*California Sta. Rpt. 1902–3, pp. 98, 99*).—Brief statements are made regarding the examination of a number of samples of oranges, wines, olive oils, gluten foods, poisoned foods, etc.

Report of the Agricultural Chemical Institute at Bern, 1902 (*Landw. Jahrb. Schweiz*, *17* (*1903*), *No. 10, pp. 543–553*).—Analyses were made during the year of 2,299 samples of fertilizers, 1,247 of feeding stuffs, 199 of soils, and 139 of miscellaneous substances. The results of the analytical and inspection work during the year are summarized and a brief outline is given of the experimental work conducted.

Report of the Agricultural Chemical Institute at Zurich, 1902 (*Landw. Jahrb. Schweiz*, *17* (*1903*), *No. 10, pp. 554–569*).—This is an extract from the annual report of the institute and consists of a summary of the results of analyses of 1,801 samples of fertilizers, 1,043 samples of feeding stuffs, and 283 of miscellaneous materials.

Annual Report of the Agricultural Experiment Station of Mauritius, 1902 (*Rap. An. Sta. Agron.* [*Mauritius*], *1902, pp. 53*).—This report contains summaries of meteorological observations during the year (see p. 756); accounts of laboratory work, including analyses of fertilizers, barnyard manure, bagasse, coal and coal ashes, and miscellaneous notes; and a discussion of the relative fertilizing value of sodium nitrate and ammonium sulphate.

A laboratory manual of physiological chemistry, R. W. WEBSTER and W. KOCH (*Chicago: The University of Chicago Press, 1903, pp. VII+107, pls. 21*).—The chapters in this volume include the chemistry of the cell and of tissues, the chemistry of foods and of digestion, the chemical and sanitary examination of milk, and the chemistry of the excretions. In the arrangement of the subject-matter "an attempt has been made to bring physiological chemistry into closer touch with the biological sciences, without unduly sacrificing connection with the clinical branches; and this manual represents the laboratory course which is given to students [at the University of Chicago] who wish general instruction in the subject, which shall be not too remote from its practical applications." The volume contains an introduction by A. P. Mathews.

Directions for laboratory work in physiological chemistry, H. C. JACKSON (*New York: John Wiley & Sons, 1903, 2. ed., pp. VI+148*).—A revised and enlarged edition of this laboratory manual designed for use in medical schools.

A back-pressure valve for use with filter pumps, R. N. KOFOID (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 1, p. 110*).—"The body of the valve is constructed of 2 pieces of glass tubing of fairly heavy gauge. . . . The valve itself is an improvement on the old Bunsen valve, with a glass rod of slightly smaller diameter than the rubber tubing, wired on, to prevent collapse. Soft rubber tubing works best. The device has given excellent service, and can be made at little expense of time and material. It was originally devised for use with condensers in a laboratory where the water pressure sometimes gave out and the water ran back. It gives equally good service for both purposes."

BOTANY.

Economic botany, H. M. HALL (*California Sta. Rpt. 1902–3, pp. 127–140*).—As in the previous reports the author gives an account of the various lines of investigation carried on by the assistant botanist at the station. These include identification of plants and reply to inquiries concerning them, the care of an economic herbarium, collection and preparation of seeds, a study of the weeds and poisonous plants of the State, and studies and investigations in economic botany. Notes are given on a number of the economic plants that have been under investigation, and lists are given of the identifications made during the period covered by the report.

Distribution of seeds, plants, and cuttings, E. J. WICKSON (*California Sta. Rpt. 1902–3, pp. 141–153*).—A synopsis is given of the distribution of seeds and plants carried on by the station for 18 years. Notes are also given on various seeds and plants which have been distributed, their economic uses being indicated.

The economic garden, A. V. STUBENRAUCH (*California Sta. Rpt. 1902–3, pp. 153–160*).—A tabular report is given showing the results of test plat cultures made with various grasses and other forage plants.

Relation of soil to the distribution of vegetation in the pine region of Michigan, E. B. LIVINGSTON (*Abs. in Science, n. ser., 19* (*1904*), *No. 474, pp. 167, 168*).—A study is reported of 15 townships of Michigan, the soils being classed as clay, clay loam, sandy, loam, and sand. The region is glacial and consists of ridges and plains, the former being usually gravelly and sandy, while the latter are loamy sand, clay, or nearly pure sand. The vegetation on the different portions is divided

into upland and lowland types. In general, the upland types follow in their distribution the distribution of soils, the hard wood occuring on low clay plains, on swamp margins in loamy soil, and on certain plains of loam which are well covered with humus.

The white pine occurs on ridges of clay loam, clay, and also on swamp margins in loam and clay. The Norway pine type was found on loamy sand plains and on ridges of sand and gravelly loam, while the jack pine type occupies exclusively the well-washed sand plains. The only complicating factors in this distribution are the effect of humus, which seems to be able to make rather poor sand support hard woods. According to the author, the real factor which determines the distribution is the power of the soil to hold water, and this increases with the fineness of particles or the presence of humus.

The taxonomic value of the spermogonium, J. C. ARTHUR (*Abs. in Science, n. ser., 19 (1904), No. 474, pp. 171, 172*).—The physiological significance of the spermogonium is as yet unknown, although it is assumed to be associated with the sexual reproduction of the organism. The author claims that among the Uredineæ are 2 classes of spores, the teleutospores which are doubtless of sexual character, and the conidia, which are either æcidia or uredospores. The spermogonium always appears in the life cycle as the first fruiting structure. If the first subsequent spore structure is the uredo, there is no æcidium in the cycle. If it is a teleutospore, there is neither æcidium nor uredo. The presence of the spermogonium, therefore, furnishes important information regarding the extent of the life cycle of the fungus. The form, size, and origin furnish minor diagnostic characters.

Pot experiments to determine the limits of endurance of different farm crops for certain injurious substances, F. B. GUTHRIE and R. HELMS (*Jour. and Proc. Roy. Soc. New South Wales, 36 (1902), pp. 191–200*).—Noted from another source (E. S. R., 14, p. 945).

The enzym-secreting cells in the seedlings of maize and dates, H. S. REED (*Abs. in Science, n. ser., 19 (1904), No. 474, p. 175*).—During the process of germination seedlings of maize and dates produce an enzym for the solution of endosperm. According to the author, this enzym is secreted from a differentiated layer of cells, which show continuous morphological changes during the time the enzym is being secreted. When the secretion begins these cells are full of fine proteid granules, but as the secretion progresses they constantly disappear.

In the early stages of secretion the nuclei of the secreting cells of maize are found in the basal end of the cell. In the latter stages they are in the apical end next the endosperm layer. As the secretion progresses there is a continuous increase in the amount of chromatin in the nuclei of the secreting cells. At the same time the nucleoli decrease in size and staining properties, and at the end of the process the protoplasm of the secreting cells breaks down and the products of disintegration disappear.

The histology of insect galls, M. T. COOK (*Abs. in Science, n. ser., 19 (1904), No. 474, p. 174*).—The author says that the function of the gall is to furnish nutrition and protection for larvæ. The simplest form of galls shows only 2 zones, the inner nutritive one and the outer protective zone. In the most highly developed galls 4 zones are shown, the inner zone being nutritive and the others protective. In the simplest galls where there are only 2 zones the inner layer is rich in protoplasm, starch, etc., until the insect has become nearly mature, while the other zones furnish tannin. A separation of the second and third zones, which occurs in some of the more highly developed galls, is believed to be a protective device.

Symbiosis in Lolium, E. M. FREEMAN (*Abs. in Science, n. ser., 19 (1904), No. 474, pp. 172, 173*).—In a previous paper (E. S. R., 14, p. 842) the author has described the life cycle of the fungus of *Lolium temulentum* and other species. Further experiments show that the fungus does not produce spores and that there are 2 races of

each species of grass, one with and one without the fungus symbiont. Of these the race associated with the fungus is slightly the more vigorous. The present state of knowledge seems to indicate that the fungus belongs to the Ustilagineæ, which has lost the power of spore formation.

On a culture of buckwheat in the presence of a mixture of algæ and bacteria, Bouilhac and Giustiniani (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 26, pp. 1274–1276*).—Experiments are reported which show that *Nostoc punctiforme* and Anabœna covered with bacteria grow rapidly on a soil entirely free of organic matter and increase its content of nitrogen. The experiments showed further that a plant like buckwheat thrives and develops normally in such a soil as a result of the action of these micro-organisms.

The chemical stimulation of algæ, E. B. Livingston (*Abs. in Science, n. ser., 19 (1904), No. 474, pp. 173, 174*).—A study is reported with the polymorphic alga Stigeoclonium, in which it is shown that with relatively high osmotic pressure the alga produce only spherical cells, while with low osmotic pressure it grows out in long, branching filaments. Zoospores are formed only with a low pressure and, upon germination, they form filaments. If filaments are placed in a medium of high pressure they break up into round cells or form groups of round cells.

When the solution of low osmotic pressure had added to it a trace of poison such as nitric or sulphuric acid, copper sulphate, silver nitrate, etc., the alga took upon itself the Palmella form as though the pressure were high. If the poison was still more diluted, there was a stimulation of zoospore production, though their germination was checked. Nitrates and sulphates were used, and it appeared that the cations had the effect of producing the Palmella form in a solution whose osmotic pressure is far too low to bring about this result.

The effect of chemical irritation upon the respiration of fungi, Ada Watterson (*Abs. in Science, n. ser., 19 (1904), No. 474, p. 178*).—Experiments were conducted with *Sterigmatocystis nigra* and *Penicillium glaucum*, the irritants used being zinc sulphate, iron sulphate, and lithium chlorid. The results obtained show that, although the economic coefficient of the sugar was increased, the carbon dioxid respired remained proportionally the same.

ZOOLOGY.

Index generum mammalium: A list of the genera and families of mammals, T. S. Palmer (*U. S. Dept. Agr., Division of Biological Survey, North American Fauna No. 23, pp. 984*).—In this number of North American Fauna the author presents an alphabetical index of the genera of mammals, an alphabetical index of families and subfamilies, and an index of genera arranged according to orders and families. A detailed index of genera is appended to the bulletin. In an introduction the author outlines the purpose of the publication, which has been in course of preparation for a period of 12 years. An attempt is made to furnish not only the accurate name of each genus, with the name of the originator of the generic name and the date, but also other notes regarding synonymy and similar information of value to the student of systematic zoology.

Wonder horses and Mendelism, C. B. Davenport (*Science, n. ser., 19 (1904), No. 473, pp. 151–153*).—From a discussion of several recorded cases of the transmission of abnormalities, the author concludes that "while Mendelian principles seem applicable to some cases of crosses between sports and the normal species, there seem to be others where neither Mendel's nor Galton's law of inheritance holds."

The feeding habits of Sorex vulgaris, G. Röric (*Arb. K. Gesundheitsamte, Biol. Abt., 4 (1903), No. 1, pp. 121, 122*).—Observations were made on the feeding habits of this species of shrew. The animals were kept in confinement where they could be readily observed, and the data obtained are presented in a tabular form.

Rats in Martinique, P. des Grottes (*Jour. Agr. Trop.*, *3* (*1903*), *No. 29*, *pp. 330–332*).—In Martinique perhaps the most important animal enemies of sugar cane are rats. Notes are given on the habits of these animals and means which have been found more or less effective in preventing their ravages.

Experiments in destroying mice in barns and mows by means of the organism isolated from susliks, S. S. Mereshkowsky (*Centbl. Bakt. u. Par.*, *1 Abt.*, *Orig.*, *35* (*1903*), *No. 1*, *pp. 25–36*).—The destruction of mice in barns and haymows is considered to be in some respects more difficult than the control of these animals in the field. The author's experiments have been continued since 1894, and consist in placing dough infected with cultures of an organism which he obtained from susliks in the runways of mice about barns and in haymows. In all the experiments dead mice were found in considerable numbers within a few days after the exposure of the infected dough, and the mice continued to die rapidly for a period of about 1 week.

In the case of 4 haymows which were infected in the manner just described and thoroughly examined 10 days after infection, the extent of mortality was found to vary from 79 to 95 per cent. The species of mice chiefly concerned were *Mus domesticus* and *M. musculus*. The author believes that this method is practical and exceedingly effective under such conditions.

Studies on the economic importance of insectivorous birds, G. Rörig (*Arb. K. Gesundheitsamte, Biol. Abt.*, *4* (*1903*), *No. 1*, *pp. 1–50*, *figs. 8*).—The author discusses in all its bearings the general problem of the economic relations of birds. In order to obtain a clear conception of the value of birds, it is considered necessary to determine what insects are beneficial and to what extent; the quantity of food, especially injurious insects, consumed by insectivorous birds; and the species of insects which serve chiefly as the food of these birds. The author discusses in great detail the question of what insects may be considered beneficial, and concludes that the value of parasitic and predaceous insects to the farmer has been greatly overestimated.

The agency of insects in fertilizing flowers is noted and conclusions reached that insects are of more benefit in this regard than in any other. While about 3,000 species are known as constant visitors of flowers, the number which are really of importance in the pollination of flowers is much smaller. The most important families are bees, wasps, Muscidæ, Bombylidæ, and Syrphidæ. None of these species, however, possess a power of flight which would insure them against the attacks of insectivorous birds, but as a rule the beneficial insects appear to be fully as well if not better protected from destruction by birds than are injurious species. The author states emphatically his belief, based upon numerous experiments and personal observations, that parasitic and predaceous insects can not be depended upon to control any injurious species, or even greatly to reduce its numbers.

In order to determine the amount and kind of food of insectivorous birds the author carried on a number of feeding experiments in large aviaries in gardens. The birds employed in these experiments included a number of species fed various kinds of food, including beneficial and injurious insects. The behavior of the different species and their economic value are discussed in detail. The author concludes from these experiments that the destruction of insects by insectivorous birds may be so extensive as to greatly reduce the numbers of injurious species in any locality. The author's experiments in determining the preferred food of various insectivorous birds are presented in detail and indicate the importance of continuing experimental work in this line, and also support the author's conclusion regarding the value of insectivorous birds.

The relation of insectivorous birds to fruit growing, J. P. Fort (*Proc. Georgia State Hort. Soc.*, *27* (*1903*), *pp. 70–75*).—Attention is called to the insectivorous habits of a large number of common birds, and to the value of these birds to the farmer.

The economic value of our native birds, H. A. SURFACE (*Pennsylvania State Dept. Agr., Zool. Quart. Bul. 1 (1903), No. 3, pp. 32*).—Brief popular notes on the habits and economic relations of vultures and hawks.

Studies on the food of our native birds with special reference to hawks and owls, G. RÖRIG (*Arb. K. Gesundheitsamte, Biol. Abt., 4 (1903), No. 1, pp. 51–120, pls. 3, fig. 1*).—A detailed discussion of the food and feeding habits of various species of hawks and owls found in the German Empire, and also certain species of crows, woodpeckers, cuckoos, pigeons, grouse, stork, etc. Data obtained from an examination of the stomach contents and from field observations are presented in tabular form. Special attention was devoted to a study of the pellets cast up by owls.

Report of the A. O. U. committee on the protection of North American birds, W. DUTCHER (*Auk, 21 (1904), No. 1, pp. 97–208, pls. 7, figs. 2*).—In this report an account is given of the work of the committee of the American Ornithological Union on the protection of birds, and also of the National Committee of Audubon Societies. The work of these societies in various States is briefly outlined, and notes are given on the legislation regarding bird protection in various States and Territories.

METEOROLOGY—CLIMATOLOGY.

Climatology of California, A. G. MCADIE (*U. S. Dept. Agr., Weather Bureau Bul. L, pp. 270, pls. 19, figs. 21*).—The available data relating to pressure, temperature—including frost, precipitation—including snowfall and fog, thunderstorms, and earthquakes for different sections of the State (north, central, and southern coast, great valley, and Santa Clara Valley), and for various localities are summarized in tables, charts, diagrams, etc.

"The general climatic conditions of the Pacific coast, and particularly the climate of California, may be said to be controlled by four great factors. These are:

"(1) The movements of the great continental and oceanic pressure areas—the so-called permanent 'highs' and 'lows.' Under this head we include also the most active factor in climatic development, namely, the movements of individual pressure areas, since there is now good ground for believing that the paths of these individual disturbances—large-sized whirls and counter whirls—are largely determined by the general relations of the permanent pressure areas.

"(2) The prevailing drift of the atmosphere in temperate latitudes from west to east.

"(3) The proximity of the Pacific Ocean with a mean annual temperature near the coast line of about 13° C. (55° F.), a great natural conservator of heat, and to which is chiefly due the moderate range of temperature along the coast from San Diego even to Tatoosh Island.

"(4) The exceedingly diversified topography of the country for a distance of 200 miles from the coast inland."

These factors are discussed in detail.

Climatic conditions at California substations, A. V. STUBENRAUCH (*California Sta. Rpt. 1902–3, pp. 162, 175, 179, 186, 198*).—Monthly summaries are given of observations on temperature, rainfall, and cloudiness during the period from January 1, 1902, to June 30, 1903, at the Foothill, Southern Coast Range, San Joaquin Valley, Southern California, and Santa Monica substations. A summary of seasonal (September to May) rainfall at Paso Robles from 1897 to 1903 is also given.

Meteorological observations, A. O. LEUSCHNER ET AL. (*California Sta. Rpt. 1902–3, folders opp. p. 160*).—This is a synopsis of observations at Berkeley on atmospheric pressure, temperature, precipitation, relative humidity, cloudiness, and direction of the wind during the 2 years ended June 30, 1903.

Meteorological observations at the Michigan Agricultural College for 1902 (*Michigan Sta. Rpt. 1903, pp. 98–121*).—Tabulated daily and monthly sum-

maries of observations during 1902 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc.

Meteorological records for 1902 (*New York State Sta. Rpt. 1902, pp. 448-456*).—Tables are given which show the average monthly temperature and precipitation since 1882; the daily wind record for each month of 1902; a monthly summary of the direction of the wind from January to May, inclusive; tridaily readings of the standard air thermometer during each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings; and daily readings of maximum and minimum thermometers at 5 and 6 p. m. for each month of the year.

Meteorology (*Rap. An. Sta. Agron.* [*Mauritius*], *1902, pp. 1-9*).—Observations on pressure, temperature, and rainfall at Mauritius during 1902 are summarized and compared in part with similar data for 1901. The mean temperature of 1902 was 22° C.; the maximum 30°, in November; the minimum 11°, in August. The rainfall was 1,736.5 mm. (68.22 in.), of which 968.4 mm. fell during the night. The heaviest rainfall occurred during December, January, February, and March, varying from 3.53 in. in March to 11.79 in. in December. For the rest of the year the monthly rainfall varied from 1.46 in. in April to 2.64 in. in October and November, averaging something over 2 in.

Variations in the transparency of the atmosphere (*Science, n. ser., 19* (*1904*), *No. 476, p. 274*).—In a brief summary of the report of the secretary of the Smithsonian Institution to the board of regents attention is called to observations with the bolograph which showed "a notable variation of atmospheric transparency which is likely to have affected climate and the growth of vegetation over a considerable part of the earth's surface . . . so that there seems renewed promise of progress toward the goal 'for telling by such means those remoter changes of weather which affect harvests.'"

Forests considered in their relation to rainfall and the conservation of moisture, J. H. Maiden (*Jour. and Proc. Roy. Soc. New South Wales, 36* (*1902*), *pp. 211-240*).—This is a discussion of the subject from the standpoints of (1) the effect of forests and other vegetation in increasing the rainfall, and (2) their effects in conserving moisture. As a result of his experience of Australian forestry, the author states that "taking an extensive territory, it appears to be indisputably proved that forests do not increase rainfall; it is fully as well proved that they conserve the rain that falls, and therefore every effort should be made to save them from unnecessary destruction."

WATER—SOILS.

Analyses of waters, G. E. Colby (*California Sta. Rpt. 1902-3, pp. 66-83*).—The results of analyses of 275 samples of water examined with reference to their fitness for domestic and irrigation purposes are reported. A general summary of the results is given in the following table:

Number and character of samples of water examined.

Source.	Total number of waters examined.	Suitable for domestic or irrigation purposes.	Of doubtful use.	Not suitable for domestic or irrigation purposes.
Lakes and streams	19	15	2	2
Springs	70	41	12	17
Common wells	153	101	10	42
Artesian wells	19	14	2	3
Reservoirs and irrigation ditches	14	14		
Total	275	185	26	64

On investigations on drinking water, O. von Czadek (*Ztschr. Landw. Versuchsw. Oesterr., 6 (1903), No. 12, pp. 797–807, fig. 1*).—This article discusses methods of bacteriological and chemical examination of water, describes a device for taking samples with precautions to be observed in the operation, and reports analyses of 22 samples of water.

Notes on the water supplies in the Black Hills of South Dakota and vicinity, Ellen H. Richards (*Tech. Quart., 16 (1903), No. 4, pp. 309–312*).—Sanitary analyses of 14 samples of water from this region are reported.

The water supplies of southeastern Alaska, Ellen H. Richards (*Tech. Quart., 16 (1903), No. 4, pp. 304–308*).—Sanitary analyses of 17 samples of water from different localities in southeastern Alaska are reported. The author concludes that, "on the whole, the country seems to be well provided with good soft water fairly accessible."

The industrial uses of water, H. de la Coux, trans. and rev. by A. Morris (*London, 1903, pp. 364, ill.*).

Water supply, drainage, and epidemics, K. A. Widegren (*Agr. Jour. Cape Good Hope, 24 (1904), No. 1, pp. 72–80*).—The author shows the close connection of a great number of infectious diseases with drainage and water supply, and the importance of securing a proper drainage scheme and a water supply which is protected from all chance of infection.

Definition of physiological analysis of the soil, H. Vanderyst (*Rev. Gén. Agron. [Louvain], 11 (1902), Nos. 9, pp. 410–421; 10, pp. 437–462; 12, pp. 552–559; 12 (1903), Nos. 1, pp. 23–30; 2, pp. 65–72; 3, pp. 115–120; 4, pp. 172–180; 5, pp. 218–221; 6, pp. 273–276; 7–8, pp. 289–293*).—A detailed discussion of this subject summarizing fully the author's views and extensive experience, and including extracts from various other authorities. The expression "analysis of the soil by the plant," as opposed to chemical analysis of the soil, was first used by Ville; later the expression "physiological analysis of the soil" was substituted for it. These two phrases designate in a general way various methods, more or less analogous, used to determine the fertility and productive capacity of soils, and including pot, box, and plat experiments on different plants with various fertilizing materials. As the author points out, these methods of experimentation are synthetic rather than analytic, because they give at best only indications of the composition of the soil.

The development of this method in Europe for experimental purposes was due very largely to the work of Ville, Joulie, Proost, the author, and others. The disappointing results which had been yielded by chemical analysis caused the method to be welcomed with enthusiasm, and following the lead of Ville extravagant claims were made for it as a reliable and accurate means of determining the fertilizer requirements of soils for both scientific and practical purposes. The method appealed especially to the practical man and served a useful purpose in encouraging experiments on the fertilizer requirements of soils. The author was among the first to recognize the serious limitations of the method, and to attempt to perfect it so that it would yield reliable and useful results. His first studies along this line were made in 1887. Similar studies of the method were afterwards taken up by Smets and Schreiber, the object being to develop a suitable method for determining, with reasonable accuracy, the fertilizer requirements of the soils of Belgium for use in the preparation of agronomic charts. In this article the author attempts to point out the limitations of the method and to indicate the means by which it may be made stable, definite, and rational.

At the outset the author sharply differentiates between physiological analysis of the soil and mere fertilizer experiments. The first to be of scientific value must include only experiments with simple and chemically pure fertilizing materials under clearly defined conditions as regards every detail, and has for its object the determination of the fertilizer requirements of a given soil for a particular plant. Such

experiments require as much skill as laboratory methods, and are too complicated for the average farmer to undertake. Fertilizer experiments are the logical supplement of physiological analysis, since their object is to determine which of the various commercial fertilizing materials available will most efficiently and economically supply the fertilizer requirements indicated by the physiological analysis. Such experiments may be made with advantage by farmers.

Modern investigators clearly recognize the fact that the simple methods advocated by Ville and others are entirely unreliable, and that it is not possible to deduce from the results of such experiments by a simple calculation the exact quantities of fertilizer to be restored in practice. Reliable results can be obtained, and these results can be properly interpreted only when the numerous possible sources of error, both of execution and of interpretation, are taken into account and precautions taken to eliminate them as far as possible. The author enumerates the following points:

(1) In the first place the law of minimum on which the method so largely rests is by no means absolute as applied to such experiments—i. e., the fertilizing constituents are more or less replaceable or interchangeable, and the mineral composition of the plant varies to a considerable extent with the excess or deficiency of certain elements of plant food. Then again certain fertilizing constituents may improve only the quality and not affect the quantity of the product.

(2) A disturbing factor is also introduced by the fact that even in the simplest fertilizing material the constituent under investigation is necessarily combined with other constituents, and it is often difficult to tell how far the particular effect observed is due to the form of combination or to the associated constituents.

(3) Moreover, certain fertilizers do not serve simply as sources of plant food, but also modify the physical conditions in the soil, act as solvent and diffusing agents, correct acidity and other unfavorable conditions, aid nitrification, etc.

(4) The soil renders certain of the fertilizing constituents applied unavailable. If, for example, by analysis by the plant of a soil rich in organic matter a lack of phosphoric acid is found, one must not conclude *à priori* that restitution of phosphates is necessary. This soil may be rich in unavailable phosphoric acid, and in that case it would be of greater advantage to destroy the excess of humus by liming, harrowing, etc.

(5) Account must also be taken of the fact that some fertilizers are more soluble and diffusible than others and are less readily absorbed by soils.

(6) With an abundant supply of water in the soil and free transpiration from the plant a smaller amount of plant food in the soil may suffice for the needs of the plant than if the reverse were the condition. In other words, fertilizers are most effective when the water conditions are favorable.

(7) The behavior of the plant during growth as well as the final weights must be recorded, because the two are sometimes contradictory.

(8) In experiments with mixed herbage there is a special source of error due to the fact that a form of fertilizer which favors one plant of the mixture may be injurious to another.

(9) There is always the injury due to birds, insects, and fungus diseases, etc., to be guarded against and taken into account.

The results of physiological analysis of a soil vary with the species, variety, and sometimes the individuality of the plant, the quality of the seed, the physical conditions of the soil and air, and the form in which the fertilizers are applied. The results of experiments in pots and boxes are not strictly applicable to field conditions, nor those of one year to another. From a physiological analysis made by means of oats we may not legitimately conclude that sugar beets, potatoes, clover, etc., would behave in the same manner in the same soil and under the same conditions of environment. Such an analysis would have a considerable relative and indirect value

for all other cultivated plants if we knew more of the specific rôles of the different elements of plant food and the comparative needs of plants in this respect. The usefulness of the method, however, is greatly impaired by lack of exact knowledge of the physiological needs and functions of plants.

It is evident that useful results can be obtained by the method only when it is employed under well-defined conditions, and the author offers the following general definition: Physiological analysis of soil consists of two or more comparative synthetic cultural experiments, executed systematically with one or more species of cultivated plants, in a soil modified in various suitable ways by simple and chemically pure fertilizers, with the object of determining, on the basis of the examination of the plants and the quantity, quality, and mineral composition of the crops produced the one or more necessary or useful fertilizing elements which are required by the one or more species of plants experimented with, under the conditions of environment in which the experiment is made.

The author explains in detail how the conditions imposed by this definition may be secured in experimental work. He classes experiments as complete and incomplete. The most simple incomplete analysis consists of two cultures, the one with complete fertilizer, the other with the same fertilizer minus a single element, necessary and indispensable or useful, to the experimental plant. The physiological analysis is complete when it comprehends at least the following cultures: (1) Complete fertilizer, (2) complete fertilizer without phosphoric acid, (3) complete fertilizer without nitrogen, (4) complete fertilizer without potash, (5) complete fertilizer without lime, (6) complete fertilizer without magnesium, (7) complete fertilizer without iron, (8) complete fertilizer without sulphuric acid, (9) complete fertilizer without common salt. For purposes of comparison a culture without fertilizer is generally added. Properly speaking, the latter is not at all a part of physiological analysis.

It is not only necessary to experiment with different kinds of plants, but to use as large a number as practicable of individuals of the same kind. Comparison is made in all cases with the culture receiving a fertilizer which is complete with reference to the needs of the plant and the character of the soil, all the other cultures receiving identically the same fertilizer, absolutely or relatively complete, with the exception of a single fertilizing element. The importance of using only simple and chemically pure fertilizers is strongly emphasized.

The experiments must as far as possible be so made that the results may be interpreted in strict conformity to the method of difference. This, however, is an ideal condition not realized in practice under present conditions of knowledge. The conclusions as to the effect of the fertilizers experimented with must be based upon (1) the general aspect of the crops—height, color, resistance to parasites, to tendency to lodge, etc.; (2) their quantity; (3) their quality—richness in sugar or starch, flavor, palatability to animals, etc.; and (4) their mineral composition—content of phosphoric acid, potash, etc.

In discussing the value of chemical and physical examination as a means of studying the productive capacity of soils, and as an adjunct to the method of physiological analysis, the author says that, as a general rule, up to the commencement of the nineteenth century the most advanced agronomists occupied themselves almost exclusively with the physical properties of soils. The biological laws, which control the growth of plants, were for the most part unknown, and inexact, erroneous, or false ideas were current regarding the causes which determine the fertility of soils. On this point Liebig made the following observation in 1840:

"It is very singular that our most distinguished, most capable agronomists have taken so much trouble the last sixteen years to demonstrate that the soil conserves all its fertility even when the fixed principles which it has lost are not restored to it.

They teach that a fertile field is inexhaustible in regard to the fixed substances which plants contain, and consequently can never become deficient."

In the author's opinion agronomists imbued with such prejudices could not attach any real importance to chemical analysis of the soil. It should be stated, moreover, that the methods of chemical analysis were very imperfect at that time. In fact, the earlier methods of chemical analysis of soil were so unreliable and therefore came into such disrepute that many eminent chemists, including Fresenius, Müntz, Risler, Colomb-Pradel, Schloesing, Berthelot and André, Petermann, Grandeau, and Wolff, devoted a great deal of attention to studies having as their object the improvement of these methods. As a result of this activity, however, chemical methods were made so complicated and tedious as to become impracticable, while at the same time they did not show in a precise manner the influence of the soil on the growth of plants.

Chemical analysis is capable of showing with great accuracy, and with close agreement in the hands of independent analysts, the percentage composition of soils, but can not be relied upon to show the form of combination or the availability of the constituents, nor does it furnish a reliable basis upon which to estimate the amounts of plant food which may be rendered available during the growth of a crop by the physical, chemical, and biological agencies constantly at work in the soil.

Even with the most complete information furnished by a complete chemical analysis of soil, no one can deduce from it, with any certainty, the results which will be obtained by analysis of the soil by the plant. The chemist can, however, instruct us upon the nature and the total quantity of elements necessary, useful, indifferent, or injurious to vegetation which the soil contains; and such precise knowledge of the chemical composition of the soil, as well as of its mineralogical, geological, and physical characteristics, is essential to the proper interpretation of the results of physiological analysis.

The water-soluble potash of the soil and its utilization by plants, T. Schloesing, Jr. (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 26, pp. 1206–1209; abs. in Rev. Sci.* [*Paris*], *5. ser., 1 (1904), No. 2, p. 55*).—In earlier experiments plants grown in artificial soils of pure quartz were able to derive their potash from solutions applied to the soil which contained only from 1.8 mg. to 7.5 mg. of potash per liter (E. S. R., 12, p. 36).

Further experiments were made by the same method followed in similar studies on water-soluble phosphoric acid in the soil (E. S. R., 14, p. 341), to determine whether plants are able to derive their potash from such dilute solutions as occur in natural soils. Samples of 4 different soils used in 2 series of experiments, in one of which plants were grown and in the other the soil was kept bare, were exhausted by continuous extraction with water and the potash so removed from the cropped and uncropped soils determined. The proportion of potash so removed was in all cases smaller on the cropped soil than on the uncropped soil, the difference between the 2 varying from 65 to 123 mg. per kilogram of dry soil and approximating quite closely in every case the amounts of potash found by chemical analysis in the crop grown.

On the influence of the relative proportions of lime and magnesia in soils on the yield, O. Loew (*Chem. Ztg., 27 (1903), No. 100, pp. 1225, 1226*).—Referring to a recent article by Gössel (E. S. R., 15, p. 564) containing conclusions not in accord with Loew's theory of a necessary relation between lime and magnesia in soils, the author points out that, while the details of Gössel's experiments are not reported, the disagreement of his results with those of Loew and his associates may be explained by the fact that Gössel used secondary potassium phosphate in his experiments, while in the other experiments primary potassium phosphate was used. It has been shown that the secondary phosphate greatly reduces the injurious effect of an excess of magnesium salts in water cultures.

In conclusion the author cites numerous authorities for the conclusions that (1) magnesia salts and calcined magnesia in certain amounts act injuriously on plants; (2) a moderate liming is beneficial to many soils, but excessive liming may reduce the yield; (3) calcium salts reduce the injurious effect of an excess of magnesia, and in presence of a sufficient amount of lime the magnesia may play an important rôle as plant food. The majority of the experiments which have heretofore been made have indicated that for cereals as a rule the best ratio of lime and magnesia is 1 to 1. For other plants, and especially leafy plants, the amount of lime should be two or three times as great as that of magnesia.

Examination of soils, R. H. LOUGHRIDGE, E. W. HILGARD, ET AL. (*California Sta. Rpt. 1902–3, pp. 23–37*).—This includes descriptions and analyses of samples of soils from the northeastern lava bed region and the coast range region of California, Sacramento Valley, and southern California, with a discussion of the humus content of the soils of the humid and arid regions of Oregon. The analyses of the Oregon soils show that those of the arid region of that State contain a low percentage of humus, which is rich in nitrogen, while those from the humid region contain a high percentage of humus poor in nitrogen.

The chemical nature of the soils of New South Wales, with special reference to irrigation, F. B. GUTHRIE (*Agr. Gaz. New South Wales, 14 (1903), No. 11, pp. 1078–1087*).—Mechanical and chemical analyses of typical soils of the semiarid parts of New South Wales are reported and discussed with reference to their adaptability to irrigation. The average composition of 19 such soils is as follows: Capacity for water, 40 per cent; volatile matter, 5.7 per cent; nitrogen, 0.08 per cent; lime, 0.44 per cent; potash, 0.33 per cent; phosphoric acid, 0.21 per cent. These averages are compared with those of a large number of analyses of soils from different parts of the world. "From the chemical point of view discussed in this paper there is no room for doubt that the soils of our arid districts are admirably adapted for cultivation by means of irrigation, abundance of water, properly applied, being the only thing necessary to render them extraordinarily fertile."

Two years' field work of the chemical branch, F. J. HOWELL (*Jour. Dept. Agr. Victoria, 2 (1903), Nos. 1, pp. 5–14; 2, pp. 177–186, pl. 1*).—A discussion of the soil requirements of the different districts of Victoria.

"Bleisand" and "Orstein," A. MAYER (*Landw. Vers. Stat., 58 (1903), No. 3–4, pp. 161–192; abs. in Centbl. Agr. Chem., 32 (1903), No. 12, pp. 798, 799*).—These two substances, which are found associated with each other in humus soils, are defined and described. The first is a metallic-gray sand impregnated with humic acid, the second is a slightly coherent chocolate-brown sand strongly impregnated with humates of iron and aluminum mixed with more or less clay. The conditions essential to the formation of the two substances are explained.

On the influence of the assimilable nitric nitrogen in cultivated soils on the action of tubercle bacteria, F. NOBBE and L. RICHTER (*Landw. Vers. Stat., 59 (1903), pp. 167–174; abs. in Chem. Ztg., 28 (1904), No. 3, Repert. No. 1, p. 6*).—Pot experiment during 1895, 1897, and 1898, on the influence of an abundance of nitric nitrogen in the soil on the activity of tubercle bacteria of hairy vetch are reported. The results show that the inoculated soils produced much larger crops, which were richer in nitrogen than the uninoculated soils. The nitrogen assimilation of the inoculated over the uninoculated soil increased as the nitric nitrogen in the soil declined, i. e., it was least the first year (1895) following applications of potassium nitrate (500 and 1,000 mg. of nitrogen to each 4.5 liter pots of soil which already contained 0.4 per cent of nitrogen); greater the second year (1897) when no nitrate, but a large amount of garden soil was added, which increased the soil nitrogen to 0.59 per cent; and still greater the third year (1898) when no fertilizing material was added and the soil nitrogen was only 0.38 per cent.

The after-effect of soil inoculation for leguminous plants on other crops, F. Nobbe and L. Richter (*Landw. Vers. Stat., 59 (1903), No. 3-4, pp. 175-177*).—Oats grown in soil which had been used the previous year in the inoculation experiments referred to above were largely increased in yield as an after-effect of the inoculation. This increase is attributed to the larger amounts of nitrogen furnished by the roots of the leguminous crop in the inoculated soil.

Notes on nitrification, H. H. Cousins (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 1, pp. 1-9*).—A general discussion of this subject.

The life conditions of nitrate bacteria, H. Buhlert (*Fühling's Landw. Ztg., 53 (1904), No. 1, pp. 29-34*).—A general discussion of conditions favorable to nitrification.

On denitrification in cultivated soil, G. Ampola and C. Ulpiani (*Gaz. Chim. Ital., 33 (1903), II, p. 125; abs. in Chem. Ztg., 27 (1903), No. 99, Repert. No. 22, p. 315*).—Investigations are reported which show that under ordinary conditions calcium nitrate, which is the natural product of nitrification, is not readily acted upon by the denitrifying organisms. In order to prevent loss of nitrogen it is necessary to abstain from applications of fresh coarse manure to the soil while nitrification is in progress, and in order that sodium nitrate may be of the greatest benefit it must be applied only after the manure has undergone very complete decomposition.

Alkali and alkali lands, R. H. Loughridge et al. (*California Sta. Rpt. 1902-3, pp. 37-56*).—This includes a statement with reference to the history of investigations relating to this subject with a list of publications treating of alkali lands which have been issued either by the California Station or elsewhere by the present director of the station; and analyses of alkali soils from different parts of the State with reference to geographic distribution and distribution in different depths of soil. Observations on the latter subject at the San Joaquin Substation have shown that—

"(1) Alkali of similar strengths or similar composition is not continuous over an area of more than a few feet, and may vary very materially even at nearer points.

"(2) There is a very great difference and variability in the composition of each of the several salts in adjoining soil columns, being within danger limits in one and below the danger point for cultures in the other. Thus a culture sensitive to carbonate of soda and not to common salt might grow at a point 16 ft. east of the center line with its 1,160 lbs. of carbonate, while it would suffer if planted 16 ft. to either side, where the carbonate is 1,600 or 1,900 lbs. And similarly with reference to common salt on adjacent spots. This effect of varying amounts of an injurious salt is often felt in orchards and is marked by the suffering of single trees here and there.

"(3) The rise of alkali toward the surface is seen in the accumulation of the several salts within the upper 2 ft. in each soil column, and in the progressive diminution downward from foot to foot; but the irregularity in rise is apparent when we take each salt in the column into consideration.

The benefits of drainage, E. W. Hilgard (*California Sta. Rpt. 1902-3, pp. 64, 65*).—A brief general statement of the benefits of drainage, particularly in connection with irrigation and where alkali occurs.

Experiments in washing salt land, E. Gelé (*Jour. Khediv. Agr. Soc. and School Agr., 5 (1903), No. 3, pp. 83-90*).

The sanitary relations of the soil, H. B. Bashore (*Sanitarian, 52 (1904), No. 410, pp. 42-44*).—A brief discussion.

FERTILIZERS.

Annual report on the working of the sewage farm at Mánjri for 1902-3, P. R. Mehta and J. W. Leather (*Bombay, 1903, pp. 11, chart 1*).—Comparative tests on sugar cane, onions, peanuts, yams, and other crops of the effluent from a septic tank and of the same effluent after passage through the contact beds are reported. The

former was found to be much more effective as a fertilizer. This is due to the higher percentage of nitrogen in the effluent. The average nitrogen content of the crude sewage at different periods was as follows:

Nitrogen content of crude sewage during different months.

[Parts per 100,000.]

	Total nitrogen.	Ammonia nitrogen.	Organic nitrogen.
December	4.35	2.36	1.99
January	3.99	1.63	2.36
February	3.69	1.51	2.18
March (16-30)	9.53	2.60	6.93

The richer sewage in March was due to addition of night soil. In the septic tank the sewage lost 3 per cent of its nitrogen during the first 16 hours, and 4 per cent more in the next 8 hours during December; 10 per cent and 4 per cent, respectively, during January; and 19 and 3 per cent, respectively, in February. With the stronger sewage of March the loss of nitrogen amounted to 22 per cent during the half month. Similar losses occurred when the effluent from the septic tank was passed through contact beds, varying from 5 to 40 per cent of the original nitrogen of the sewage. The average composition of the sewage as it left the septic tank was as follows:

Fertilizing constituents in effluent from septic tank.

[Parts per 100,000.]

	December.	January.
Nitrogen	4.07	3.42
Phosphoric acid	1.92	1.72
Potash	1.47	1.37

"If the irrigation rate be assumed as 4,000 gal. per acre per day this sewage would supply 1.5 lbs. nitrogen, 0.73 lb. phosphoric acid, and 0.57 lb. potash."

Influence of the nature of the exterior medium on the mineral composition of plants, A. Hébert and G. Truffaut (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 24, pp. 1235-1239*).—The authors have already reported investigations (E. S. R., 9, pp. 451, 755; 12, p. 851) from which they concluded that a rational basis for fertilizing was furnished by chemical analysis of typical plants grown under normal conditions and the determination of the fertilizing constituents furnished by the soil. They here report ash analyses of dracæna, chrysanthemum, cyclamen, and mint grown on fertilized and unfertilized soil, which seem to bear out this conclusion in that the mineral composition of the fertilized plants was not as a rule appreciably different from that of the unfertilized plants.

The authors therefore conclude that for a given species of plant grown on a given soil the use of a complete fertilizer increases the yield but does not affect the mineral composition. However, a special fertilizer like sodium chlorid or nitrate may increase the assimilation of the principal element which the compounds contain without disturbing to any great extent the relative proportions of the other mineral constituents.

Influence of the nature of the exterior medium on the organic composition of plants, A. Hébert and E. Charabot (*Bul. Soc. Chim. Paris, 3. ser., 29 (1903), No. 24, pp. 1239-1247*).—Experiments similar to those noted above were made to determine the influence of various salts of sodium, potassium, iron, and manganese

on the organic composition of peppermint. The results show that with the exception of nitrogen the relative proportions of the organic constituents were but slightly affected, the only marked effect of the fertilizers applied being either to increase or decrease the yield.

Fixation of atmospheric nitrogen by dead forest leaves, E. HENRY (*Ann. Sci. Agron., 2. ser., 1902–3, II, Nos. 2, pp. 313–320; 3, pp. 321–327*).—Observations are recorded from which the conclusion is drawn that dead forest leaves, either alone or mixed with soil, have the power when resting upon a moist substratum of soil to fix the free nitrogen of the air. The dead leaves of forests growing on poor dry soils do not fix nitrogen at all or only in insignificant amounts.

On the decomposition of dead leaves in forests, E. HENRY (*Ann. Sci. Agron., 2. ser., 1902–3, II, No. 3, pp. 328–333*).—The observations recorded show that in case of leaves kept in zinc boxes the salts of this metal formed retarded decomposition of the leaves to a marked extent. Decomposition was most rapid in summer and almost ceased in winter. Leaves of the oak (*Quercus robur*), which are tough and rich in tannin, were decomposed more slowly than the leaves of hornbeam (*Carpinus betulus*).

Fertilizers for new land, C. A. MOOERS (*Univ. Tennessee Record, 7 (1904), No. 1, pp. 31, 32*).—In field experiments with potatoes, beans, peas, cucumbers, tomatoes, and radishes on naturally fertile and durable new land containing more than the average amounts of phosphoric acid and nitrogen for East Tennessee soils, it was found nevertheless that applications of quickly available phosphoric acid and nitrogen gave profitable returns. The nitrates increased the vigor of the plants, while the phosphoric acid hastened maturity.

On the phosphoric acid of Thomas slag, T. KNÖSEL (*Chem. Ztg., 28 (1904), No. 4, pp. 38, 39*).—The author explains the merits of his patented process for the treatment of Thomas slag with concentrated sulphite solution.

Florida phosphate trade (*Engineer and Min. Jour., 77 (1904), No. 7, p. 285*).—Statistics of exports of Florida phosphate during 1903 are given. These amounted to 617,981 long tons.

Perchlorate in nitrate of soda, A. VERWEIJ (*Chem. Weekblad, 1 (1903), pp. 155–159; abs. in Chem. Centbl., 1904, I, No. 3, pp. 206, 207*).—The author claims that it is not established that the injurious effect observed from time to time in case of plants fertilized with nitrate of soda is due to perchlorate. He claims that nitrates containing large amounts of perchlorate have often been used without injurious effect, while on the other hand the use of nitrate practically free from perchlorate has in some cases resulted in serious injury.

On the action of perchlorate in nitrate of soda, B. SJOLLEMA (*Chem. Weekblad, 1 (1903), pp. 125–129; abs. in Chem. Centbl., 1904, I, No. 3, p. 206*).—A reply to the article by Verweij noted above.

FIELD CROPS.

The culture substations, A. V. STUBENRAUCH (*California Sta. Rpt. 1902–3, pp. 161–194*).—The field work of the California substations for the season of 1901–2 is summarized (for that in horticulture see p. 773).

At the Foothill Substation near Jackson fertilizer experiments were conducted with oats, wheat, and barley grown as hay crops. The most profitable returns were obtained on granite soil from the use of 80 lbs. per acre of nitrate of soda applied alone. Lime proved unprofitable. On red soil an application of 800 lbs. of Thomas phosphate and 160 lbs. of nitrate of soda per acre gave a profit of $11.70, which was second to the returns for nitrate of soda alone. In this experiment half of the nitrate was applied in January and the other half in March.

Brief notes are given on a number of saltbushes and grasses grown at the Southern

Coast Range Substation at Paso Robles. A number of saltbushes, especially *Rhagodia spinescens inermis*, *Atriplex cachiyuyum*, *A. pamparum*, and *A. nummularia*, grew very well without irrigation during the summer and withstood the rather severe winter frosts. The plants formed compact bushes from 3 to 4 ft. high and seemed to prove valuable as browsing plants for both summer and winter.

Among the different plants tested at the Southern California Substation, *Lupinus albus* seemed promising for green manuring purposes. The results with berseem (*Trifolium alexandrinum*), indicated that it is not as valuable as alfalfa. The one-flowered lentil (*Ervum monanthos*), obtained through this Department, made a good growth in 1901 but suffered from drought in 1902.

Report of the agriculturist, E. R. LLOYD (*Mississippi Sta. Rpt. 1903, p. 11*).—In 1902 24 varieties of corn were grown on poor red hill soil, with yields varying from less than 1 bu. to 20 bu. per acre.

Eighteen varieties of cotton grown on upland soil made an average yield of 954 lbs. of seed cotton per acre, with the yields of the individual varieties varying from 700 to 1,260 lbs. In a fertilizer test on poor upland the largest yield of seed cotton per acre, 1,000 lbs., was obtained from a plat receiving 125 lbs. each of cotton-seed meal and kainit per acre, and the smallest yield, 240 lbs., from a plat fertilized with 250 lbs. of cotton-seed meal per acre. The cotton on a plat where 250 lbs. of kainit per acre was applied was practically free from rust, and plats receiving liberal applications of barnyard manure were only slightly affected. The unmanured plats and those on which cotton-seed meal and acid phosphate were used, separately or in combination, were badly rusted.

The Woburn field experiments, 1901, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 308–330, figs. 3*).—The data presented for the experiments in continuous growing of wheat and barley represent the twenty-fifth season (E. S. R., 14, p. 27). Street Imperial wheat was grown with different fertilizer applications. Nitrate of soda throughout gave better results than ammonia salts, either used alone or with mineral fertilizers. The plats receiving ammonia salts, alone or with minerals but without lime, showed signs of failing. The improvement due to 2 tons of lime per acre applied in 1897 with ammonia salts containing 50 lbs. of ammonia was still perceptible. Rape cake furnishing 100 lbs. of ammonia per acre gave a crop equal to that from $3\frac{1}{2}$ cwt. of superphosphate of lime, 200 lbs. sulphate of potash, 100 lbs. sulphate of soda, 100 lbs. of sulphate of magnesia, and $2\frac{1}{2}$ cwt. of nitrate of soda. The best yield in grain and straw was obtained on the plat treated with barnyard manure supplying 200 lbs. of ammonia per acre. As in former seasons, nitrate of soda gave the lowest weight per bushel.

The experiments with barley were made with the Standwell variety. Mineral fertilizers gave an increase of over 2 bu. per acre, and barnyard manure, as in the case of wheat, gave the best returns. Rape cake furnishing 100 lbs. ammonia per acre, applied annually since 1890, also gave good returns. The beneficial influence of lime was manifest wherever it had been used. Barley plants on unlimed distinctly acid soil were stunted in growth with their roots poorly developed, while plants on limed soil were healthy and well developed with plenty of rootlets. Nitrate of soda used alone produced the lightest grain and the largest proportion of small kernels, with the lowest value per bushel.

Mustard, rape, and tares were plowed under for green manuring, and followed by wheat. One-half of each plat received superphosphate and kainit, but no apparent advantage resulted from this application. The best quality of grain was produced after rape and mustard.

In a variety test with barley, Goldthorpe, Burton Malting, and Golden Melon ranked in the order given in the production of grain and straw. Standwell and Burton Malting ripened earliest. The results for 3 years show no advantage from kiln-drying the seed before sowing.

Sandy, Potato, and Tartar King oats yielded 30.2, 61.6, and 36 bu. per acre, respectively.

Wheat on heavy and light soils gave the best yields when sown at the rate of 8 pks., as compared with 7, 9, 10, and 13 pks. per acre.

The experiments with alfalfa plainly showed the superiority of the plats receiving potash in the fertilizer application. English Giant sainfoin ranked above French Common, English Common, and French Giant in the production of green forage. A total yield of 4 tons, 698 lbs. of green fodder per acre, was obtained from *Lathyrus sylvestris.*

The results of experiments on pasture indicated a general improvement of feeding over mowing the grass. Including rye grass in the seed mixture gave a marked increase in the hay crop. The thickly-seeded plats continued to give the heavier yields. The use of lime produced a marked effect on the yield and general appearance of the plats. In another experiment 5 cwt. of mineral superphosphate per acre gave a heavier yield of hay than 8 cwt. of basic slag. There was no apparent increase in the clover where basic slag was used.

Cooperative field trials (*Univ. Ext. Col. Reading, Agr. Dept., Ann. Rpt. Field Trials and Expts. 1903, pp. 21–39*).—The results of cooperative trials are briefly reported. The yield of mangels, the quantity of important constituents produced per acre, and the percentage of water contained in the roots are shown in the following table:

Results of a variety test with mangels at Burghfield in 1902.

Varieties.	Yield of roots.	Water.	Dry matter.	Ash.	Organic matter. Total.	Organic matter. Nitrogenous.	Organic matter. Nonnitrogenous.
	Tons.	*Per cent.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
White Sugar	23	86.30	7,091	316	6,785	357	6,428
Red Sugar	22¼	84.50	7,725	314	7,411	339	7,072
Golden Tankard	22	86.12	6,773	386	6,387	478	5,909
Prizewinner	24½	88.50	6,284	470	5,811	437	5,374

In a fertilizer test with mangels, carried out at West Wycombe, a plat receiving 2 cwt. of nitrate of soda and 4 cwt. each of superphosphate and kainit per acre, yielded 26 tons per acre, being the best yield in the test. A plat receiving 2 cwt. of common salt in addition to this application gave the same yield, while the plats receiving no manure or incomplete applications produced considerably less.

Experiments were also made with different quantities of seed and different widths of drilling barley and oats. In both tests the drills were 7⅓ and 11 in. apart. Barley was sown on 6 plats at rates ranging from 1 to 3½ bu. per acre, making a difference of ½ bu. of seed between each 2 contiguous plats in the series. The yield of barley was practically the same on both series of plats, but the wider drilling produced the most straw. The proportion of small kernels as well as the average weight per bushel was greatest on the narrow drilled plats. On the wide drilled plats the largest yields were obtained from the use of 2 bu. of seed per acre. The weight per bushel in both distance tests was greatest from the smaller quantities of seed.

In the experiments with oats the seed used ranged from 2½ to 5 bu. per acre, also making a difference of ½ bu. between any plat and the next one to it in the series. The total yield of grain and straw was the best on the narrow-drilled plats. The largest quantity of good grain was obtained from the narrow drilling, and from 2½ bu. of seed per acre. Good results were also secured where from 4 to 5 bu. of seed were used.

Tests at Burghfield of fertilizers for hay on clay loam soil with very stiff clay subsoil illustrated the lasting effect of basic slag, superphosphate, and kainit, these fer-

tilizers having been applied 5 years before. The results of this season not only showed increased yields as compared with the check tests, but also an improvement in the quality of the herbage.

Fertilizer experiments were also conducted on old pasture with clay soil of a brick-earth character and a red-clay subsoil. Barnyard manure and an application of 10 cwt. basic slag, 6 cwt. kainit, and 1 cwt. nitrate of soda per acre gave about the same increase over the unmanured plat, but the use of barnyard manure was the most expensive. Basic slag was not very effective on this soil, but kainit produced a very marked increase in the yield of grass.

Field and other experiments, 1902, D. A. Gilchrist (*County Councils Cumberland, Durham, and Northumberland Rpt. 1902, pp. 129*).—This publication is a compilation of the results of cooperative experiments with fertilizers and seed mixtures for hay and pasture, together with other fertilizer and rotation tests. Cooperative experiments with fertilizer applications for permanent meadows have been in progress for a number of years, and the results are here tabulated and discussed in detail. In each locality the experiments were conducted on different kinds of soils.

Of a number of seed mixtures for hay and pasture in one of the tests a mixture consisting of 9.3 lbs. of *Lolium perenne*, 4.9 lbs. of *Dactylis glomerata*, 3.1 lbs. of *Phleum pratense*, 13 lbs. of *Festuca pratensis*, 0.9 lb. of *Poa trivialis*, 2.3 lb. of *Trifolium pratense*, 2.1 lbs. of *T. hybridum*, 5.6 lbs. of *T. repens*, and 0.3 lb. of *Achillea millefolium* per acre gave the best results.

An application of 12 tons of barnyard manure with 1 cwt. nitrate of soda, 1 cwt. sulphate of ammonia per acre, with another hundredweight nitrate of soda as a top-dressing after thinning, is recommended for mangels. The results obtained in these experiments are considered as confirming the general opinion as to manuring the mangel crop. In a test with swedes Fell Bronze Top and Arctic surpassed the others in content of dry matter. Considerable differences in the percentage of dry matter were presented by the same varieties of swedes grown on different farms. The individual root appeared to be the greatest cause of the difference, while such factors as variety, season, and soil are regarded as secondary.

Experiments at the County Demonstration Farm, Morpeth (*County of Northumberland, Education Com. Rpt. 1902–3, pp. 19–41*).—A summary of experiments on meadows in progress for 6 years shows that the annual application of 8 tons of barnyard manure, $\frac{5}{16}$ cwt. of sulphate of ammonia, $\frac{7}{16}$ cwt. of nitrate of soda, $\frac{7}{8}$ cwt. of superphosphate, 75 lbs. of slag, and 50 lbs. of sulphate of potash per acre gave the best returns, being followed by the use of 8 tons of barnyard manure alone, with a yield of 5 cwt. per acre less. Complete applications of commercial fertilizers also gave good and profitable results, and giving $\frac{1}{2}$ of the nitrogen in the form of nitrate of soda showed an advantage over sulphate of ammonia as the only source of this element. When potash was omitted the yield was not decreased, but the quality of the hay was considerably better when it formed part of the application. The omission of nitrogenous fertilizers reduced the yield of hay about 5 cwt. per acre.

The results of two 4-year rotations on the same land with different fertilizer applications are given in tables. Turnips, oats, hay and oats were grown in the first rotation, and swedes, barley, hay and oats in the second. Barnyard manure wherever used in the first rotation gave good returns, and these were best when the manure was applied to the root crop. The highest returns were obtained from the plat on which roots received 20 tons of barnyard manure per acre. Practically the same profits were secured from a plat upon which the root crop received a standard application of 1 cwt. of sulphate of ammonia, 5 cwt. superphosphate, and 1.25 cwt. of muriate of potash per acre, and where in addition another similar application was divided between the last 2 crops of the course and half of the crop of roots eaten on the land by sheep. The profits as here reported represent the total returns for

the 4 years. Ten tons of barnyard manure for the root crop and a standard application of commercial fertilizers for the hay also gave good results. Where potash was withheld the total value of the crops for the entire course was reduced. Barnyard manure alone was more satisfactory than the use of commercial fertilizers alone.

In the second rotation the quantity of muriate of potash in the standard applica-cation was reduced to 1 cwt. A very marked reduction in the yield took place when potash was omitted. Doubling the standard application for swedes did not benefit the crop, but resulted in an increase of 4½ bu. per acre in the yield of the succeeding barley crop. The use of 3 times the standard application for the hay crop was not profitable, but 1 cwt. sulphate of ammonia applied to each of the cereals in addition to the double standard dressing gave a marked increase in yield and thereby proved useful in extracting the residues of large quantities of commercial fertilizers previously given. As in the first rotation, 10 tons of barnyard manure gave better results than any application of commercial fertilizers.

Among 9 varieties of oats Siberian, Banner, Waverly, and Yellow Lentewitz, in the order given, produced the best yields. Waverly, although not the heaviest yielder, produced the greatest weight of kernel per acre. The straw of the Tam Finlay variety is considered the best for fodder.

Sutton Prize Winner Yellow Globe mangel produced heavier crops of roots and total solid matter than the Carter variety. In connection with this test an application of 12 tons of barnyard manure, ⅞ cwt. of sulphate of ammonia, 4½ cwt. of superphosphate, ⅓ cwt. of muriate of potash, and 2¼ cwt. of nitrate of soda after thinning gave better results than the use of 20 tons of barnyard manure and 1⅛ cwt. of nitrate of soda applied after singling. The results of another fertilizer test with mangels showed that nitrogen is the most important element for the crop, and that on light sandy soil potash is much more needed than phosphoric acid. A complete application of commercial fertilizers in addition to 12 tons of barnyard manure gave a large increase in yield over the manure alone. On this same kind of soil swedes receiving 12 tons of barnyard manure and a complete application of commercial fertilizers in addition were but slightly benefited as compared with the use of manure only.

Fertilizer experiments with potatoes on this soil also showed the special need of potash. Withholding nitrogen caused a marked reduction in the yield of good tubers, while the omission of phosphoric acid lowered the yield but little as compared with the complete application of commercial fertilizers. Twelve tons of barnyard manure increased the salable potatoes by more than 7½ tons per acre over the check plat, and where the complete application of commercial fertilizers was added this increase amounted to over 9½ tons.

Of what value is the stooling capacity of grains? W. LIPPOLDES (*Inaug. Diss., Univ. Jena, 1903, pp. 91*).—The work and views of Schribaux and Rimpau on the value of the stooling capacity of cereals are discussed, and data obtained for the purpose of demonstrating the value of the first stem produced by the plant, as compared with subsequent stems, are given. Previous articles on the work by Schribaux have been noted (E. S. R., 12, pp. 850, 941; and 15, p. 247).

The data here presented comprise the weight and number of grains per head, the weight per thousand grains, and the weight, length, and thickness of the stems of varieties of rye, wheat, and barley. The rank of the earlier appearing stems with reference to these different points is pointed out, and the principal conclusions are summarized. The acceptance of the rule laid down by Schribaux that the yielding capacity of cereals is inversely proportional to their stooling capacity is not regarded as warranted, on account of the numerous exceptions. The initial stems were not found to be regularly superior to the other stems of the plant. The study of a number of plants showed that almost without exception the initial stem was the heaviest and its head contained the largest quantity of grain by weight, while the number of grains and the thickness were also generally in its favor. In length and in the

weight per thousand grains it was frequently surpassed by the stems of later growth. The average value of the first 3 stems was found superior to the average value of the first 6 in all the points determined. No regular differences between the initial stems of plants with small and large stools were discerned.

Mineral matter in the lower part of the stems of cereals in its relation to lodging, D. Lienau (*Inaug. Diss., Univ. Königsberg, 1903, pp. 91, pls. 4, dgm. 1*).—Strube Schlanstedt oats, a variety which stands up well, was grown with different fertilizer applications in field and pot experiments, for the purpose of obtaining material for observation. The results obtained point to a relation between the mineral matter furnished in the fertilizer and the thickness of the cell wall, as well as the content of the stems in total ash, phosphoric acid, lime, potash, and crude fiber. A summary of the results and conclusions is here given.

It was found that phosphoric acid produced the most marked thickening of the cell wall, and that this influence is very much retarded by a large proportion of potash or lime applied at the same time. A heavy application of potash increased the size of the cell lumen, and large quantities of nitrogen, in addition to a like effect, reduced the thickness of the cell wall. This action of these 2 plant-food elements was neutralized when a proportionally large quantity of phosphoric acid was applied simultaneously. Ammonia nitrogen weakened the stems less than nitrate nitrogen. The plants on limed soil also showed weaker cell walls and larger cell lumen than those on unlimed soil, and this result with lime was strikingly apparent on the plats heavily fertilized with phosphoric acid. The weakening of the stems did not proceed beyond a certain point, even when several factors with such a tendency were active at the same time.

The data further show a constant analogy between the total ash of the stems and their potash content, the one rising and falling with the other. When large quantities of potash, nitrogen, and lime were used the stems contained more total ash and potash than when only small quantities were given. The increase in these substances through lime was particularly heavy on the plat receiving ammonium sulphate. A liberal use of phosphoric acid decreased the total ash and potash content of the stems in a number of instances. A definite maximum in the content of total ash and potash was never surpassed, even when several favorable factors were working in conjunction.

The quantity of phosphoric acid in the stems showed no connection with the quantity applied in the fertilizers, and the results apparently indicate that the liberal use of potash, nitrogen, and lime further the absorption of phosphoric acid by this part of the plant.

On the nitrate-of-soda plats a connection between the phosphoric acid given in the fertilizer application and the lime content of the stems was observed. The plats heavily fertilized with phosphoric acid produced plants with considerably less lime in the stems than the plants receiving little or no lime. On the ammonium-sulphate plat heavy applications of potash and nitrogen increased the quantity of lime taken up by the stems. The silicic acid, iron, and sodium in the stems showed no connection with the fertilizers applied. The crude fiber appeared to be increased in the straw by heavy applications of phosphoric acid, and, in case of insufficient plant food, also by the use of lime.

An anatomical study of the plants under observation showed that fertilizing with phosphoric acid increased the thickness of the cell wall, while the use of potash, nitrogen, and lime was prejudicial to this process. The results of analyses indicate that phosphoric acid has a tendency to diminish the ash and some of its components, while potash, nitrogen, and lime had the opposite effect. The thickness of the cell wall was inversely proportional to the content of ash, or certain ash constituents, in the stems, but this was definitely determined only for total ash and potash, and not for phosphoric acid and lime. These experiments are not considered adequate to

prove an actual connection between the thickness of the cell wall and the quantity of ash constituents in the stems. The results are regarded as showing with certainty only that large quantities of phosphoric acid in the fertilizer increased the thickness of the cell wall, and that potash, nitrogen, and lime were in this respect retarding factors.

The author recommends that, in addition to the different precautions taken to prevent lodging, attention should be given to the application of fertilizers in this connection, and that, for instance, when it is necessary to fertilize heavily with lime or nitrogen, sufficient phosphoric acid be also applied to counteract the tendency of weakening the stems.

A list of 17 references bearing on different phases of the question under consideration is given.

The practical application of Mendel's law in cereal breeding, E. TSCHERMAK (*Deut. Landw. Presse, 30* (*1903*), *No. 82, pp. 712, 713*).—After a discussion of Mendel's law, the author presents observations made in breeding wheat, barley, rye, and oats. He found in his work with wheat that the presence and absence of awns, and hairyness and smoothness, appeared strictly to follow the law of Mendel, the absence of awns and hairyness being dominant. The recessive characters, presence of awns, and smoothness, which appeared in one-fourth of the number of individuals in the second generation, remained constant. In color of head, brown was dominant in the first generation over whitish yellow, but in the second generation numerous intermediate forms appeared. The heads relatively darkest and those relatively lightest in color were found most likely to reproduce themselves, but were not constant. The relation between long and short, and open and compact, heads and few and many-flowered spikelets, also proved irregular. The author further observed in his experiments that in the first generation long and open heads with a small number of flowers were dominant over short and compact heads with a larger number of blossoms.

In his work with barleys he observed the following relation of characters:

Dominant characters.	*Recessive characters.*
Dark-colored heads.	Light or yellowish color of heads.
Two-rowed.	Four-rowed.
Two-rowed.	Six-rowed.
Bearded.	Hooded.
Beardless.	Bearded.
Beardless.	Hooded.
Normal form of head.	Branched form of head (*Hordeum compositum*).
Nutans type (no transverse furrow across base of grain).	Erectum type (transverse furrow across base of grain).
Long-haired rachilla.	Short-haired rachilla.
Glumes, nerves denticulated.	Glumes, nerves smooth.

In oats a dark color in the glumes and the seemingly correlative color of the grain were dominant over the light or yellowish color, and the spreading pannicle over the one-sided form. On account of insufficient data, no conclusions with reference to rye are given.

References to recent work in plant breeding, C. FRUWIRTH (*Jour. Landw., 51* (*1903*), *Nos. 2, pp. 223–230; 4, pp. 371–387*).—References are given to 48 recent articles on plant breeding, including work with tobacco, flax, potatoes, rape, beets, clover, and cereals. A brief abstract of the article is given in each case. A number of the articles have reference to Mendel's law.

Barley sickness of soils, A. ATTERBERG (*Jour. Landw., 51 (1903), No. 2, pp. 163–171*).—The results of experiments here reported indicate that for barley culture the moraine soil under observation, of which an analysis is given, requires applications of potash fertilizers in order that the supply of readily soluble potash compounds may be maintained. It was found that most of the northern varieties of barley are not so readily affected by a lack of potash, and that they are able to take their supply from the less soluble compounds occurring in the moraine soil. Many foreign and new varieties, on the contrary, were very sensitive to an inadequate quantity of readily soluble potash. A heavy application of lime on this soil was observed to produce the same effect on barley as an application of potash.

The growth of maize for ensilage, T. J. YOUNG (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 40–47, fig. 1*).—The culture of corn for ensilage and the construction of silos are described and the results of a variety test of corn grown for ensilage are reported. An analysis of ensilage is also given. Harvey Seed sown in 12 in. drills gave the best yield, nearly 23 tons per acre, followed in the order given by White Horsetooth, Angel of Midnight, and Longfellow.

Suggestions on cotton culture, W. C. WELBORN (*Philippine Bureau Agr., Farmers' Bul. 9, pp. 12, figs. 8*).—A Spanish edition of a popular bulletin on cotton culture.

Hops, A. D. HALL (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 12–30*).—The results obtained with different systems of training hops are reported, the systems described, and their advantages and disadvantages summarized. The yields obtained for a series of years in the college garden at Wye are given in this table:

A comparison of different systems of training hops.

System.	Planting.	Hills per acre.	Relation of yields to average crops.						
			1897.	1898.	1899.	1900.	1901.	1902.	Average.
	Feet.		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Butcher	10 x5	870	76.6	116	93	91.4	90.9	100	94.5
Do	8 x8	680	111	....	107	82.7	100	86	97.4
Do	7 x7	890	111	114	106	104	89.5	76	101.1
Do	7 x6	1,037	106	96.7	105	113	101	127	108.1
Do	$6\frac{1}{2}$x$6\frac{1}{2}$	1,031	....	....	99	109	99.5	....	102.5
Butcher (3 strings to pole)	6 x6	1,210	....	....	83.6	93.3	101	114	98
Umbrella	6 x6	1,210	95.3	90.7	111	124	112	112	107.5
Worcester	$7\frac{1}{2}$x$3\frac{1}{4}$	1,786	93.8	99.2	94	107	106	100	100

In reviewing the advantages of the different systems the author recommends planting a little wider than is usual.

The results of fertilizer experiments in 1902 confirm previous conclusions that the hop shows no special fertilizer requirements and that the subject of fertilization resolves itself into a study of the soil. On clay soil at Marden and Oxted phosphoric acid was needed, while potash was without effect; and at Farnham and Frant phosphates gave no special return, but applications of potash increased the crop. At Farnham lime is especially needed, and at Selling none of the mineral plant foods gave a marked result.

Experiments at Rothamsted on the changes in the composition of mangels during storage, N. H. J. MILLER (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 135–141*).—A paper reporting a second experiment on this subject (E. S. R., 13, p. 130). The tabulated data show that mangels stored from November to July lost 13 per cent of water, 21.1 per cent of dry matter, 22.7 per cent of organic matter, 21.7 per cent of sugar, 18.6 per cent of pentosans, 8.7 per cent of crude fiber, and 29.5 per cent of nitrogen. The loss in nitrogen was almost exclusively in nonproteids, but there was no indication of increased digestibility.

The author concludes that, apart from the loss in nitrates, there can be no material improvement in mangels when stored. The results indicate the possibility of loss in sugar and digestible proteids, without giving evidence of any actual increase in he latter constituent. Analyses made of a single root kept for 1 year show a loss of 87.5 per cent in sugar, 20 per cent in crude fiber, and 4.5 per cent in furfuroids. There was no loss in total nitrogen, but half of the digestible proteids changed to nonproteids, while the indigestible proteids remained essentially the same.

The continuous growth of mangels for 27 years on the same land, Barn Field, Rothamsted, A. D. HALL (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 27–59, figs. 9*).—This article has been noted from another source (E. S. R., 15, p. 465).

The lime content of oats on limed and unlimed soil, H. G. SÖDERBAUM (*K. Landt. Akad. Handl. och Tidskr., 42 (1903), pp. 108, 109; abs. in Centbl. Agr. Chem., 32 (1903), No. 12, p. 847*).—In pot experiments previously referred to (E. S. R., 14, p. 434) different phosphates were used with and without addition of varying amounts of lime, and it was found that in 8 out of 10 cases the lime content increased with the increase of the application of lime. As regards phosphoric acid the opposite effect was produced.

Potato variety and manurial trials, K. J. J. MACKENZIE (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 34–39*).—The results of cooperative tests with commercial fertilizers and barnyard manure were not very successful, but it is believed that small quantities of active commercial fertilizers applied with barnyard manure tend to increase the yield and improve the quality over the use of barnyard manure alone. Among 5 varieties in a test carried out in this connection Charles Fidler and Up-to-Date gave the best yields. Spraying apparently increased the yield per acre by about 1 ton.

[Sweet potatoes], F. G. SLY (*Dept. Agr., Central Provinces [India] Rpt. 1902–3, pp. 12, 13*).—In this report it is stated that trials were made of 15 varieties of sweet potatoes, 12 indigenous and 3 American. The American varieties proved much the best, producing large crops of excellent tubers. A large number of plants of American sorts have been distributed to cultivators in the provinces.

Culture tests with rye, 1899–1902, W. EDLER (*Arb. Deut. Landw. Gesell., 1903, No. 84, pp. 171, pls. 9*).—Cooperative culture tests were conducted for 3 years with 9 varieties of rye. The weather conditions of the seasons are described, abstracts from the reports of collaborators are given, and the results, including the yields of grain and straw and the weight per 1,000 grains, are reported. Brief descriptions are also given of growing plants of the different varieties in the plant nursery, of developing varieties, and of their resistance to winter weather and rust attacks.

Lochow Petkus rye gave the highest average yield of grain in dry as well as in wet seasons. North German Champagne rye, owing to its low water requirements, is considered suitable for dry soils. On the better soils and in wet years this variety gave smaller yields of grain than most of the sorts tested. Alt-Paleschken rye stood first in yield of straw. The heaviest weight per 1,000 grains was in favor of Lochow Petkus, while Heine Improved Zeeland showed the highest weight per liter. The stooling capacity was greatest in Probstei, North German Champagne, Walkenhaus, and Russian Giant Stem, and the length of straw in Alt-Paleschken, Schlanstedt, Russian Giant Stem, and Walkenhaus.

In thickness of stem, Schlanstedt, Heine Improved Zeeland, and Alt-Paleschken ranked above the others. Schlanstedt and Heine Improved Zeeland appeared to have the stiffest straw and North German Champagne the softest. It was found that North German Champagne ripened earliest, followed a little later by Pirna, Probstei, Walkenhaus, and Russian Giant Stem, and these were again followed by Lochow Petkus, Heine Improved Zeeland, and Alt-Paleschken, while Schlanstedt

ripened last. With reference to their winter resistance the varieties are ranked as follows: Alt-Paleschken, Probstei, North German Champagne, Russian Giant Stem, Walkenhaus, Pirna, Lochow Petkus, Schlanstedt, and Heine Improved Zeeland. The resistance to cold winters was below the average in the last 3 varieties. The experiments presented no data from which conclusions as to the resistance of the different varieties to lodging and rust could have been drawn.

Improvement of sugar cane by chemical selection (*Agr. News* [*Barbados*], *3* (*1904*), *No. 46, p. 19*).—An abstract is given of the main features of an investigation by J. D. Kobus on the subject of raising improved varieties of sugar cane by vegetative reproduction. It was observed that the amount of sugar in the individual stems of the same plant was likely to vary greatly. For the experiment in question plants exhibiting small variations were selected for propagation. The variability in the amount of sugar was greatest in thick-stemmed, older varieties, and least in young varieties recently selected from seed. The quantity of sugar in the cane varied directly with the weight of the same.

Heavy plants produced heavy offspring and the descendants of plants with a high sugar content were richer in sugar and heavier than unselected plants. Simple selections, however, of cuttings of heavy plants produced forms generally richer in sugar but not markedly so, and the progeny of heavy plants poor in sugar seem to contain a smaller quantity of this same substance than the progeny of light plants with a low sugar content. Local variations in soil, which was apparently quite uniform, gave rise to great differences between individual plants. It was discovered that the increased vigor of plants as reflected in the larger yield of sugar was accompanied by greater resistance to the sereh disease.

Wheat experiments, A. D. Hall (*Jour. Southeast. Agr. Col., Wye, 1903, No. 12, pp. 31–33*).—Cooperative tests with Square Head Master and Red Lammas were made on light loam with chalk subsoil, light sandy loam, and deep loam soils. In general the yield of grain was in favor of Square Head Master and the yield of straw in favor of Red Lammas, which gave a longer and finer straw, but lodged more frequently than the other variety. On the light loam with chalk subsoil Red Lammas also gave the greater yield. Red Fife, Preston, and Percy obtained from Canada and sown April 21 yielded 28 bu. 30 lbs., 24 bu. 25 lbs., and 20 bu. 21 lbs., respectively.

HORTICULTURE.

The culture substations, A. V. Stubenrauch (*California Sta. Rpt. 1902–3, pp. 161–194*).—A general account is given of the growth and productiveness of orchard fruits, small fruits, and nuts, including apples, pears, quinces, almonds, apricots, peaches, nectarines, plums, cherries, olives, figs, walnuts, persimmons, and grapes grown at the Foothill, Southern Coast Range, San Joaquin Valley, and Southern California substations. An account of the work with field crops is given elsewhere (p. 764).

Plums and apples at the Foothill Substation have done best on granite soil. On the hill lands at this station it appears to be essential to irrigate walnuts. At the Southern Coast Range Substation practically the whole of the second crop of grapes was destroyed by linnets which visited the station in immense flocks. A large number of apples were grown at the San Joaquin Valley Substation, but under the climatic conditions of the station none of these varieties kept well. The summer temperature appears to be far too high for these fruits. Many of the apples are burnt and shriveled on the trees before they reach maturity. Blight has been especially severe on pears at this station. Grapes yielded at the rate of 7 tons of fruit per acre. At the Southern California Substation pear blight is noted as making rapid inroads on the station pear orchard. Duchesse d'Angoulême has proved one of the best late

summer pears at the substation, and appears to be sufficiently resistant to blight to enable it to produce good crops during most of the season. A variety of fig known as "White Dattato" is considered the best white fig grown at the station. Nearly all varieties of grapes have done well at this substation.

Testing varieties of vegetables, C. H. Brewer (*Amer. Agr., 73 (1904), No. 6, p. 142*).—As a result of a test of a number of varieties of vegetables the author recommends Sparks Earliana tomato, New White Evergreen corn, and Stringless Green Pod, Brittle Wax, and Wardwell Wax beans.

Treating trees that have been injured by mice or rabbits, N. O. Booth (*New York State Sta. Rpt. 1902, pp. 401–404*).—This is a reprint of a circular issued by the station, and gives directions for treatment of trees that have been more or less seriously injured by the gnawing off of the bark by mice and rabbits. Methods of bridge grafting to overcome these injuries are described.

Irrigating oranges, A. J. Hutchinson (*Pacific Fruit World, 17 (1904), No. 18, pp. 4, 5*).—The author notes that under the influence of abundant irrigation the size of oranges is becoming larger, and the fruit coarser and inferior in quality. As a remedy for this he advises the application of water to the trees just at the time a new growth is starting out from the buds. By the application of a sufficient amount of water at this time the new growth can be carried to a good maturity and desirable length. If irrigation is delayed until after the growth has acquired considerable length, then that growth that has already started is merely lengthened without producing any more fruit-bearing wood.

Examination of sugar prunes (Burbank) from several localities, G. E. Colby (*California Sta. Rpt. 1902–3, pp. 90, 91*).—Analyses, chiefly with reference to size, percentage of flesh, pits, and total sugar content are given for a number of sugar prunes and other prunes grown in different localities in California. The sugar content of the sugar prunes in the fresh fruit varied from 13.7 to 20.53 per cent, and the average sugar content of California French prunes is given as 18.5 per cent. In the dried product the sugar content of the sugar prunes was found to be 49.5 to 50 per cent, and the maximum sugar content in dried French prunes 54 per cent.

Review of preliminary work at [Cranberry] experimental station, H. A. Ramsey (*Cranberry Grower, 2 (1904), No. 2, pp. 2, 3*).—Herewith is given a rather detailed account of the experimental plats and methods of treatment in the work on cranberry culture, carried out under the auspices of the University of Wisconsin. An experiment was made to determine the effect of stretching cheese cloth about 2 ft. above the vines for the prevention of blight. The cloth, however, was not put in place soon enough and some of the vines had already begun to blight. The berries continued to blight, however, under the cheese cloth, which seemed to indicate to the author that all blight is not caused by intense heat in the presence of water.

Tests are being made of 187 varieties which have thus far been originated, and continued efforts are being made to secure more valuable varieties by cross fertilizing.

Viticulture, E. H. Twight (*California Sta. Rpt. 1902–3, pp. 111–113*).—This is an outline of the viticultural work that is now being carried on under the auspices of the station. A number of experimental plats have been established in different parts of the State, chiefly for the purpose of determining the adaptation of phylloxera-resistant stocks to the different soils of California. Two plats established in cooperation with this Department will be used to determine questions of adaptation, but mainly for testing the affinity of vinifera scions to resistant stocks. It is reported that the phylloxera is spreading throughout California, and planters are urged to use only resistant stocks in setting out new vineyards.

Attention is called to the serious character of the Anaheim disease, which has been located in at least 3 important vine-growing districts. The use of cuttings from infected districts is condemned.

Home-grown grapes in winter, D. M. DUNNING (*Country Life in America, 5 (1904), No. 4, pp. 302–305, 318–321, figs. 10*).—Detailed directions are given for the construction and management of a small grapery in which to grow high-quality European grapes.

Coffee, vanilla, cacao, and tea, G. CORNAILLAC (*El café, la vainilla, el cacao y el té. Barcelona: Francisco Sabater, 1903, pp. 480, figs. 36*).—A treatise on the cultivation, preparation, exportation, commercial classification, expenses and returns obtained in the cultivation of these crops.

A treatise on cacao (Theobroma cacao), F. E. OLIVIERI (*Trinidad, British West Indies: Mole Bros., 1903, 3. ed., pp. 101, pls. 31, dgm. 1*).—The 20 chapters in this book deal with the various phases of the botany and culture of cacao, including an account of the insects and diseases affecting, fermentation, and the drying of the crop. In discussing the value of various shade trees in cacao culture, special attention is called to the value of the immortelles for this purpose.

Some experiments performed by Professor Carmody are noted, in which it is shown by chemical analyses that the dry flowers of the 50 immortelle trees on an acre furnished about 24 lbs. of nitrogen, while the 250 cacao trees, yielding 500 lbs. of pure cacao, contained but about 12½ lbs. of nitrogen per acre. Previous analyses by the same investigator (E. S. R., 13, p. 354) indicated that the amount of nitrogen in the flowers rapidly diminished. This, however, has been found to be influenced by the method of storing the samples, since when the flowers are spread out thinly instead of in heaps no loss of nitrogen was observed, even when freely exposed for several days to the air.

The objection sometimes made by planters to this tree because of the loss of leaves during the dry seasons is shown to be really an advantage, since with the decrease in number of leaves on the trees at this time there is a corresponding decrease in the amount of water evaporated from the soil.

Indian tea; its culture and manufacture, C. BALD (*Calcutta: Thacker, Spink & Co., 1903, pp. 291, pls. 9, figs. 7, dgm. 1*).—This work is intended as a text-book on the cultivation and manufacture of Indian tea. It gives in extended detail directions for the management of tea estates, including the operations of planting and manufacture, and also hints on buildings, machinery, forestry, accounts, etc. Various insects and diseases affecting tea are also noted, with suggestions as to methods for their control. The book is comprehensive, and appears to cover practically every phase of the subject, except the chemistry of tea and the history, bibliography, and statistics of tea.

The Landolphia of French Congo yielding caoutchouc (*Sci. Amer. Sup., 57 (1904), No. 1467, p. 23,511*).—This is an English translation of a paper by A. Chevalier, given before the French Academy of Science. It contains a botanical account and descriptions of the species of Landolphia in French Congo which yield caoutchouc.

Experiments with ether in the forcing of lilacs, K. RÄDE (*Möller's Deut. Gärt. Ztg., 19 (1904), No. 5, pp. 50–52, figs. 3*).—An account is given of the forcing of Charles X and Marie Legraye lilacs with and without etherization. Under like conditions of temperature the etherized lilacs come into bloom considerably earlier than the unetherized. The advantages of etherizing are briefly stated as follows: The time required to bring the plants into bloom is lessened; they can be forced at a lower temperature with less fuel, and consequently less expense; more leaves develop on the etherized plants, which may be desirable in some cases. In these experiments the temperature of the forcing room varied between 20 and 25° C. A temperature lower than 18 to 20° C. is not considered sufficiently high to give satisfactory results.

Forcing etherized plants, A. MAUMENÉ (*Jardin, 18 (1904), No. 407, pp. 42, 43*).—The details are given of several experiments in forcing lilacs, snowballs, and *Azalea mollis*. In every instance with all these plants those which had been sub-

jected to the fumes of ether started into growth earlier and came into bloom sooner than those which had not been etherized. The author calls attention, however, to the desirability of considering the climate, temperature, and season in forcing plants by means of ether. If the normal period of etherization be 48 hours, then early in the season etherization for 72 hours is advised, while later in the season etherization for 24 to 30 hours may suffice. With an increase of temperature also the length of time of etherization should be decreased.

The book of shrubs, G. GORDON (*London and New York: John Lane, 1903, pp. 83, pls. 14*).—This is the fifteenth of a series of Popular Handbooks of Practical Gardening, edited by Harry Roberts. Directions are given for the culture and use of a large number of deciduous flowering trees and shrubs, including many American shrubs, deciduous shrubs and trees with ornamental foliage, evergreens, conifers, and bamboos.

The book of herbs, ROSALIND NORTHCOTE (*London and New York: John Lane, 1903, pp. 212, pls. 18, fig. 1*).—This book is the twelfth of a series of Popular Handbooks of Practical Gardening, edited by Harry Roberts. Of the 212 pages in this book, but 12 are devoted to the culture of herbs, the remainder containing historical notes on the use of herbs in medicine, magic, decorations, heraldry, ornament, perfumes, etc. The book has very little value from an agricultural standpoint.

Pictorial practical fruit growing, W. P. WRIGHT (*London: Cassell & Co., Ltd., 1903, pp. 152, figs. 108*).—This book aims to teach pictorially the essential facts of fruit growing. Sufficient text is given to complete and make clear the illustrations and the cultural details necessary in growing all the common orchard and small fruits, nuts, melons, etc.

Pictorial practical gardening, W. P. WRIGHT (*London: Cassell & Co., Ltd., 1903, pp. 157, figs. 129*).—The purpose of this little book is to present in a concise manner by aid of apt illustrations, supplemented by a small amount of text, all of the essential features in the culture of flowers and the making of flower gardens; and to a more limited extent fruit and vegetable gardens and the growing of plants in greenhouses.

Pictorial practical bulb growing, W. P. and H. J. WRIGHT (*London: Cassell & Co., Ltd., 1903, pp. 152, figs. 45*).—This book contains in condensed form concise statements, supplemented by numerous illustrations, on the culture of bulbs, interpreting the word in its broadest sense. Preliminary chapters treat of the planting of bulbs in beds, borders, pots, glasses, vases and bowls, window boxes, woodlands, and grass. Following this are 46 chapters dealing with as many different flowers which are grown from bulbs. The pictures are the prominent part of the book and are intended to represent the essential facts in the handling and culture of bulbs.

Bulb growing in the State of Washington, S. W. FLETCHER (*Country Life in America, 5 (1904), No. 4, pp. 311–314, figs. 10*).—An account of the origin and development of the bulb-growing industry in the State of Washington. It is claimed that bulbs superior in quality to Holland bulbs can be grown in the vicinity of Puget Sound.

Bulb culture in the South Atlantic States, W. F. MASSEY (*Country Life in America, 5 (1904), No. 4, pp. 313, 314*).—An account is given of the development and present status of bulb culture in the South Atlantic States, more particularly east North Carolina. The author claims to have eradicated the Bermuda lily disease from his experimental fields. For a further account of the work see E. S. R., 14, p. 445.

Pictorial practical rose growing, W. P. WRIGHT (*London and New York: Cassell & Co., Ltd., 1902, pp. 152, pl. 1, figs. 87*).—This is a brief popular guide to the propagation, pruning, and general culture of roses both out of doors and under glass. Numerous illustrations are designed to take the place of much of the descriptive and detailed matter usually found in books of this sort.

Chrysanthemums and how to grow them, J. B. Wroe (*London: W. H. & L. Collingridge, pp. 86, pl. 1, figs. 12*).—Detailed directions are given for the growing of chrysanthemums for exhibition purposes, with descriptions of numerous varieties. An account is also given of the insects and diseases affecting chrysanthemums, with suggestions for their control, and in addition a table in which the time for starting cuttings of each of 349 varieties, methods of manuring, and other data are given.

The new Shasta daisies (*Pacific Rural Press, 67 (1904), No. 8, p. 113, figs. 2*).—Descriptions are given of two new Shasta daisies, the Alaska and the California, originated by Luther Burbank. The flowers of these varieties average from $4\frac{1}{2}$ to 5 in. across, and are borne on stems 2 to 3 ft. long. Each flower is composed of 38 to 42 wide petals with a very small disk. It is claimed that these flowers are perfectly hardy and will grow anywhere in the United States.

The improvement of home grounds, F. Cranefield (*Wisconsin Sta. Bul. 105, pp. 39, figs. 32*).—This is a popular discussion of the subject of beautifying home grounds, more especially those in the country. It treats of the desirability of massing shrubs and trees, and the necessity of a well thought-out design in planting about the home. A number of diagrams and figures are given showing proper and improper methods of planting.

How to make a flower garden (*New York: Doubleday, Page & Co., 1903, pp. 370, pls. 60, figs. 148*).—This book is made up of a collection of articles on annual and perennial flowers, shrubs, trees, vines, ferns, water gardens, window gardens, cold frames, hot beds, greenhouses, wild gardens, roses, etc., written by as many different authors. It is profusely illustrated; many of the articles and illustrations have previously appeared in *Country Life in America*. The appendix contains lists of flowers for special purposes and brief directions on how to grow 150 of the commonest and most desirable flowers.

The flower beautiful, C. M. Weed (*Boston and New York: Houghton, Mifflin & Co., 1903, pp. 138, pls. 17, figs. 41*).—This contains suggestions on the use of vases and like utensils in which to exhibit flowers for decorative purposes.

FORESTRY.

The university forestry stations (*California Sta. Rpt. 1902–3, pp. 195–201*).—A review is given of the condition of the forestry stations, and a criticism offered of the present method of carrying on these investigations. At present the funds are insufficient for the proper carrying on of the work, and the writer thinks that more money should be put at the disposal of these forestry stations in order that the work may be extended in various lines.

At the Santa Monica Station the principal investigations have been conducted with a view to planting a portion of the upper mesa, most of which was planted to species of eucalyptus, golden wattle, Catalina cherry, and Austrian pine. The results of the seed planting have not been very satisfactory, only a few of the pines and acacias coming up. A special effort was made to plant as large a portion of the plat to eucalypts as possible, in order to test the adaptability of various species to forest planting. The limited amount of available land made it impossible to plant more than a half acre of each variety, and it is hoped that from these plats more accurate and valuable data will be obtained than that hitherto secured, which was often based on a few individual trees. In planting these plats the operations were begun in November and continued throughout the winter, a few plants being set in February and March. The results as shown in the growth of the different lots of trees indicate that fall planting is best for coast regions where the winter temperatures do not fall below the freezing point.

A brief account is given of the distribution of more than 10,000 trees to various tree planters, the distribution being made under definite conditions laid down by the station.

At the Chico Forestry Station the principal investigations have been confined to setting out plantations of tanbark oak (*Quercus densiflora*) and cork oak (*Q. suber*). Four acres each of these varieties were planted with the acorns. In the case of the tanbark oak the acorns were placed in a sprouting bed before planting in the field and the ground was specially prepared for the reception of the young seedlings. A similar method was followed with the cork-oak acorns, but there was not time for the preliminary sprouting of them as they were received too late in the season.

The weather succeeding the planting was unfavorable to growth and germination, and in the case of the tanbark oaks only about 50 per cent germinated and grew for a few inches, after which many of the young seedlings perished. In the case of the cork oaks about 20 per cent of the acorns germinated, most of which remained alive. The results of these plantings show the difficulty of establishing plantations of oaks by seeding the open ground, and unless the season is exceptionally favorable either the surface of the soil should be mulched or the acorns sown under the protection of forest litter.

A comparison was made of the value of 1-year-old eucalyptus seedlings for transplanting as compared with those 4 months old. Practically all of the larger trees died, while 80 per cent of the smaller ones survived. The results obtained confirm the previous experiences in other portions of the State.

Southern forests twenty-five years ago and to-day, C. A. SCHENCK (*Tradesman, 50* (*1904*), *No. 9, pp. 75, 76, figs. 4*).—A review is given of the forest conditions in the Southern States, the status of 25 years ago being contrasted with that of the present time. The lumber output in the South has risen in that time from a value of $40,000,000 to $180,000,000 annually, with a corresponding increase in the capital invested. Attention is called to the necessity of rational methods of management to preserve this industry and at the same time develop the agricultural resources of the region.

Hawaiian forests, W. L. HALL (*Forestry and Irrig., 9* (*1903*), *No. 12, pp. 582–585, figs. 5*).—A description is given of the forests of the Hawaiian Islands, based upon recent observations of the author. Two distinct types of forest are recognized, one which occurs at sea level in the drier portions of the islands, and the other on the mountain slopes at elevations of 1,000 to 8,000 ft. The first type is valuable on account of the timber and other products which it yields; the second for its protective value. Much of the forest, which occurs near sea level, consists of algaroba or mesquite (*Prosopis juliflora*). The distribution and value of this species are commented upon and the character of the mountain forests described. Attention is called to the rapid decrease in the forest area, which is attributed largely to the grazing and tramping of cattle, and an outline is given of the proposed forest service which has been recently put in operation.

The commercial aspect of Australian forestry, E. T. SCAMMELL (*Queensland Agr. Jour., 13* (*1903*), *No. 6, pp. 577, 578*).—An abstract is given of an address by the author on the forest resources of Australia. According to the author, these comprise more than 107,000,000 acres of marketable timber. To this should be added 170,000,000 acres covered by inferior timber, which has a local value for building and general purposes. The commercial timbers of Australia are chiefly species of eucalyptus of which not less than 150 furnish valuable timber. Besides eucalyptus a number of other species are enumerated and their distribution and uses indicated.

The forests of Algeria in 1903, PERRIQUET (*Bul. Agr. Algérie et Tunisie, 9* (*1903*), *No. 23, pp. 521–527*).—A review is given of the forest condition of Algeria, the principal revenues of which are obtained from the timber and bark of the cork oak.

The destructive nature of forest fires, overgrazing, etc., is pointed out and the necessity for a better system of management is shown.

Tree planting in the midlands of Natal, T. R. SIM (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 20, pp. 729–734*).—In a publication noted elsewhere (E. S. R., 15, p. 588) the author has given descriptions of timber trees suitable for planting in this region, and the present paper is designed more for the planting of trees as ornamentals. It is said that trees desirable for timber production may be used for landscape planting, but many ornamental kinds have little or no economic value, and on this account it is seldom worth while attempting to combine timber production with scenic effect. In South Africa mixtures of fast-growing trees have usually proved failures, and the most successful timber plantations are those in which only one species is used.

Notes on the ornamental conifers in the lower Thames Valley, A. WORSLEY (*Jour. Roy. Hort. Soc. [London], 28 (1903), Nos. 1–2, pp. 107–111*).—Descriptions are given of a number of ornamental exotic conifers that have been planted in the lower Thames Valley, and notes are given on their relative hardiness and adaptability to different systems of planting.

Forestry, W. SCHLICH (*Agr. Students' Gaz., n. ser., 11 (1903), No. 5, pp. 131–142*).—In a lecture delivered by the author a review is given of the forestry situation of Great Britain, the sources of its present timber supply, and the steps to be taken to restore British forestry. It is said that 30 per cent of the land in Great Britain and Ireland is either entirely lying waste or used for rough grazing. Much of this is adapted to forestry, and the author believes that with proper attention it could be advantageously restocked.

Experience in Saxony in forest management is cited, and some of the problems to be considered are outlined. The average annual production, cost of planting, value of soils for forestry, etc., are discussed, after which the author states that for economic forestry in Great Britain ash, sycamore, and oak should be planted on lands which are adapted to them, and Scotch and Corsican pine and spruce with some larch on other lands. On very wet lands poplar will probably be found to be the most remunerative.

The exploitation and management of forests, P. MOUILLEFERT (*Exploitation et aménagement des bois. Paris: Félix Alcan, 1904, pp. 476, pls. 10, figs. 97*).—This is the second of a series of books by the author on sylviculture, and treats of the exploitation and management of forests. After discussing the general laws of tree growth the subject of forest exploitation is taken up and the different kinds of pure and mixed forests are described, suggestions being given for their continued propagation and exploitation. Chapters are given on the uses of forest products and a special chapter is devoted to truffles and truffle culture. In the second part of the work forest statistics are given and comparisons drawn between the different systems of forest management.

Forest reserves for public benefit, G. PINCHOT (*Water and Forest, 3 (1904), No. 4, pp. 14, 15*).—In an open letter the author defines the attitude of the Government toward forest reserves, and seeks to remove much of the current misunderstanding regarding the object and effect of forest reserves.

Investigations regarding the root development of trees, A. ENGLER (*Mitt. Schweiz. Centralanst. Forst. Versuchsw., 7 (1903), pp. 274–317; abs. in Forestry Quart., 2 (1903), No. 1, pp. 34, 35*).—Investigations are reported on the periodicity of the annual growth of different species of trees, the root activity beginning some time before bud development. An exception is noted in the case of larch, which makes its early transplanting in the spring or late fall planting necessary. The most vigorous root growth noted was made in June and July, followed by a decline in August, after which there was in October and November a second period of active growth,

which was somewhat less vigorous than the summer growth. The length of the two active periods varied with different species and climate, and the period of summer rest varied from 3 to 8 weeks. The period of maximum root growth coincided with that of maximum shoot growth. In the fall and winter the temperature of the soil was found to influence growth, all growth ceasing at from 5 to 6° C. for beech and 2 to 3° C. for maple.

Attention is called to the practical bearing of these investigations on the time of transplanting. For the most successful efforts in this line, trees should be transplanted shortly after root growth is most active. Deciduous trees can be planted in autumn with more satisfaction than conifers, because their root activity lasts longer and the demand for water at the top ceases sooner.

A nitrogen-gatherer among trees (*Norsk Landmandsblad, 22 (1903), No. 18, pp. 231–233*).—An account is given of the activity of the Danish Heather Improvement Society in planting trees on the barren sandy stretches on the western coast of Jutland. It has been found that spruce will make an excellent growth on these waste areas in the immediate vicinity of mountain pine, even if the soil is practically free from food materials. The root system of the spruce trees has only a poor development to the side where there is no mountain pine, while to the side where such a tree stands, a strong root system is developed that intertwines with the roots of the pine, often coming in immediate contact with these.

There appears to exist a symbiotic relation between these two kinds of trees, which is of mutual benefit to both. If the pine is cut down while the spruce is still young, the latter will die or make a sickly growth; if, on the other hand, it is not cut until after several years, the spruce will not only survive but appears to grow faster than would have been the case if the pine had been left standing. Planting these two trees together has come to be a general practice of the Society. There is no direct experimental evidence presented in explanation of these phenomena, but it is stated as the result of investigations by many scientists that the mountain pine is a nitrogen-gatherer and can utilize the free atmospheric nitrogen, even when growing in places where practically no supply of nitrogen can be obtained from the soil itself.—F. W. WOLL.

The effects of frost upon forest vegetation, R. G. ZON (*Forestry Quart., 2 (1903), No. 1, pp. 14–21*).—A discussion is given of the effects of early and late frosts upon forest vegetation, and the manner in which the young growth is affected is described. The effect of winter frosts is also shown, and various preventive measures like drainage, planting, etc., are described.

Forest protection and extension, M. MANSON (*Water and Forest, 3 (1904), No. 4, p. 7*).—An outline plan is given for forest protection and extension, the first of which consists of fire protection, the second of tree planting. For fire protection the author thinks that a study should be made of forest fires, and that all areas liable to injury should be mapped and patrolled for their protection. In regard to tree planting, the author believes that conifers offer the most promising field for investigation and suggests methods for collecting and planting their seed.

Forest fires in the Adirondacks, A. KNECHTEL (*Forestry Quart., 2 (1903), No. 1, pp. 2–13*).—A discussion is given of the causes of forest fires, means of controlling them, the condition in which the forest is left after a fire, and the vegetation that may spring up over the burned areas. The chief periods of forest fires in this region are April and May, and September and October. The causes of fires are quite numerous, all of which are discussed.

In the Adirondacks the beech and hard maple are the most resistant to fire, while birch, on account of its loose bark, suffers severely. Hemlock and spruce are badly injured, and white pine, although somewhat resistant, is more easily injured than the hard woods. The burned-over areas of State lands are described and attention

called to the fact that under the present law the timber can not be removed, but remains to ultimately fall to the ground and serves to add fuel to future fires.

Winter logging, R. V. R. Reynolds (*Forestry and Irrig., 10 (1904), No. 1, pp. 20–29, figs. 8*).—A popular description is given of the methods pursued in some of the larger logging camps in the Northwest.

American Forestry Association (*Forestry and Irrig., 10 (1904), No. 1, pp. 12–19*).—An account of the twenty-second annual meeting of this association, held in Washington, D. C., December 9, 1903. In the director's report which was submitted to the association, a review is given of the forestry situation in this country, and the work of the Bureau of Forestry and General Land Office of the Federal Government and of various States in forest investigations are briefly described.

DISEASES OF PLANTS.

Some diseases of cultivated plants, F. Corboz (*Bul. Soc. Vaud. Agr. et Vit., Lausanne, 1903, No. 165, pp. 407–412*).—A brief description is given of a number of mildews of cultivated plants, particular attention being paid to those belonging to the genus Peronospora. For the prevention of these the author recommends the thorough use of Bordeaux mixture. Notes are also given on smuts of cereals, for the prevention of which treating the seed with strong solutions of copper sulphate or subjecting to water heated to a temperature of 50 to 55° C. is recommended.

Cultures of the Uredineæ in 1903, J. C. Arthur (*Jour. Mycol., 10 (1904), No. 69, pp. 8–21*).—This report is in continuation of a series upon cultures of plant rusts, and embraces experiments which were inaugurated in 1899. During the season covered by the report 68 collections of materials were employed. Out of these a large number refused to germinate. As in the previous years, success was attained only when reciprocal inoculations were made between plants whose proximity to one another in the field gave definite clues to their possible relationship. A detailed report is given of the different experiments, and in conclusion a list is given of 5 species which have been previously reported and 8 whose different host plants are reported for the first time.

Index to uredineous culture experiments, with list of species and hosts for North America, I, W. A. Kellerman (*Jour. Mycol., 10 (1904), No. 69, pp. 26–45*).—An alphabetical index is given in which the host plants of a number of rusts are shown, together with the name of the author having made the culture experiments.

Potato spraying experiments in 1903, F. C. Stewart, H. J. Eustace, and F. A. Sirrine (*New York State Sta. Bul. 241, pp. 251–292, pls. 12*).—An account is given of the spraying experiments conducted under the 10-year spraying investigations, the plan of which was outlined in a previous bulletin (E. S. R., 14, p. 875). These experiments were conducted at the experiment station at Geneva and at Riverhead, Long Island, the efficiency of a different number of applications being compared. In addition, cooperative experiments were conducted with 6 farmers in different parts of the State, to determine the net profit in spraying potatoes under ordinary farm conditions. The fungicide used was Bordeaux mixture, and to prevent serious injury by leaf hoppers and potato bugs Paris green or a solution of white arsenic was added to the fungicide used in some of the sprayings. Comparisons were made between 3 applications during the growing season and spraying every 2 weeks.

At the experiment station, as well as other points where the experiments were conducted, there was little injury from the early blight, but the late blight, *Phytophthora infestans*, proved quite destructive. The effect of the spraying was markedly shown by the prolonged growing season of the treated plants, and when harvested it was found that the yields were increased in proportion to the number of applications

given the vines. At the station 3 sprayings increased the yield 88 bu. per acre and 5 sprayings 188 bu. per acre. On Long Island the increased yield due to 3 sprayings was 39.5 bu. per acre, and when 5 applications were given the vines the increase was 56 bu. per acre.

As in the previous year's investigations, the chemical analyses of the tubers from sprayed plants showed that they contained a larger percentage of dry matter, mostly starch, than the unsprayed potatoes.

The object of the cooperative experiments was to overcome the objection often made that experiments as conducted by the station do not give results that could be obtained in ordinary farm practice.

In these six cooperative trials 61.166 acres were sprayed. With a single exception, every one of the experiments proved highly successful, and the total increase with the 6 experiments was 3,746 bu., or an average of 61.24 bu. per acre. This increase was worth $1,873, and subtracting from this amount the total expense of spraying, $296.49, there is a remainder left of $1,576 51, or a net profit of $25.77 per acre, to be attributed to spraying under farm conditions. The details of all experiments are given.

Should potato growers spray? II, F. H. Hall et al. (*New York State Sta. Bul. 241, popular ed., pp. 12, figs. 2*).—A popular summary of the above bulletin.

Proof of the identity of Phoma and Phyllosticta on the sugar beet, G. G. Hedgcock (*Jour. Mycol., 10 (1904), No. 69, pp. 2, 3; abs. in Science, n. ser., 19 (1904), No. 474, p. 172*).—It has long been suspected that an intimate relation existed between the leaf blight and root-rot of sugar beets, but so far no cultural proof has been offered to show their identity. The author reports a large number of cultures from sugar beets decaying with a typical black crown rot caused by Phoma, and from the peculiar concentric brown leaf spots produced by Phyllosticta.

In all, about 50 cultures were made and no important differences could be determined between the organisms in the different sets. For the purpose of proving the identity of the fungi, sugar beets were grown in the greenhouse and inoculated with the 2 organisms, control plants being main ined, and from both sets leaf spots bearing mature pycnidia were taken, the fungus isolated, and pure cultures made with the same results as before. Beets whose roots were sound and healthy but whose leaves were diseased were placed in a moist silo, and in a month or so the petioles had become decayed and the crowns affected with all the characters of the typical Phoma rot.

The work reported indicates that in the case of the beet there is only one species of fungus producing these 2 diseases, and according to priority of generic names, the organism should be placed in the genus Phoma. It seems probable that the various species described upon sugar beets, garden beets, and mangels are identical.

A note on Rhizoctonia, G. G. Hedgcock (*Science, n. ser., 19 (1904), No. 476, p. 268*).—According to the author, the bean crop in the vicinity of St. Louis was severely injured during the past year by the fungus Rhizoctonia, which not only attacked the stems and larger leaves of the plants, but produced brown, sunken areas on the surface of the pods, penetrating the latter and discoloring the seeds.

Examination of a number of seeds whose surface was discolored disclosed the fact that the mycelium of the fungus had established itself in the seed coat and in many instances had formed minute sclerotia without rotting the seed or penetrating the cotyledons. Pure cultures of the fungus were easily obtained from such seeds and the presence of the organism did not in any way prevent the germination of the seed. From this it follows that the seed may be a common means of disseminating the disease, and on that account discolored beans should not be planted.

Apple black spot, J. Hamilton (*Queensland Agr. Jour., 13 (1903), No. 6, p. [illegible]*).—A brief account is given of experiments in spraying apple trees for the prevention of black spot. Perfect success is said to have followed the thorough spraying of the

trees with a solution composed of copper sulphate 4 lbs., alum 2 lbs., lime 3 lbs., and water 30 gals. Directions for the preparation and application of this fungicide are given.

Some diseases of coffee, A. L. HERRERA (*Com. Parasit. Agr. [Mexico], Circ. 1, pp. 8, fig. 1*).—Notes are given on the diseases of coffee caused by *Stilbum flavidum* and *Sphærella coffeicola,* the former of which is said to cause great damage to coffee plantations. The thorough use of Bordeaux mixture is recommended as a preventive measure, and extensive experiments are being inaugurated to thoroughly test the efficiency of this treatment.

The use of copper fungicides and the quality of the copper sulphate (*Chron. Agr. Canton Vaud, 16 (1903), No. 21, pp. 597–599*).—Attention is called to the great variation in the quality of the copper sulphate supplied by the markets in 1903 and the consequent variation of the results obtained when applications were made for the control of fungus diseases. In order to secure the best results, it is claimed that some attention should be paid to the quality of the chemicals used and that a Federal control should be established for the guaranty of the purity of such products.

ENTOMOLOGY

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 6 (1904), No. 1, pp. 60, figs. 4*).—At the meetings of the society the following papers were presented:

The Occurrence of the Earwig-fly, *Merope tuber,* H. S. Barber; Branched Hairs of Hymenoptera, and An Orthopterous Leaf-roller, by A. N. Caudell; The Genera of the Dipterous Family Empididæ, and A Brief History of North American Dipterology, by D. W. Coquillett; An Insect-collecting Trip to British Columbia, by R. P. Currie; Description of the Larva of *Ethmia zelleriella,* Description of the Larva of *Litodonta hydromeli,* Note on the Distribution of the Red Forms of Diacrisia, A Lepidopteron Parasitic upon Fulgoridæ in Japan (*Epipyrops nawai,* n. sp.), *Halesidota maculata* and Its Varieties, The Larvæ of the Mosquitoes *Megarhinus rutilus* and *M. portoricensis,* Notes on the Mosquitoes of British Columbia, A New Variety of the Noctuid *Exyra semicrocea* (*Exyra semicrocea hubbardiana,* n. var.), and A New Genus and Species of Tortricidæ, by H. G. Dyar; Remarks on the Genitalia of *Podisus cynicus* and *P. bracteatus,* by O. Heidemann; The Cotton-boll Weevil in Cuba (*Anthonomus grandis*), by E. A. Schwarz.

In the last-named paper the author reports his experience in studying the cotton-boll weevil in Cuba. First it was suspected that this insect might have some native food plants other than cotton. It was impossible, however, to find the weevil upon any plants except cotton. It was found feeding upon "loose cotton" (*Gossypium brasiliense*), and upon "kidney cotton." The weevil is not especially common upon or injurious to either one of these species, but the evidence obtained by the author indicates that the "kidney cotton" is the original food plant of the cotton-boll weevil, and the author believes that this insect has no other food plant than species of cotton. No parasites of the cotton-boll weevil were found in Cuba.

Report of the entomologist, G. W. HERRICK (*Mississippi Sta. Rpt. 1903, pp. 24, 25*).—Brief notes on insects injurious to pecans, peach-tree borer, Colorado potato beetle, harlequin cabbage bug, San José scale, pine-leaf beetle, fall webworm, and chicken mite.

Entomology, C. W. WOODWORTH (*California Sta. Rpt. 1902–3, pp. 104–110*).—A brief review is given of the entomological work of the station for the period 1901–3. Abstracts are given of the bulletins published during this time. Special attention is called to the work in combating grasshoppers and red spiders, in studying the subjects of peach-tree borers, fumigation, California distillates, etc., and mosquitoes.

The injury due to codling moth has apparently increased during recent years and methods for combating this insect will be investigated.

Injurious insects of 1903, F. L. WASHBURN (*8. Ann. Rpt. State Ent. Minnesota, 1903, pp. XVI + 184, pl. 1, figs. 119*).—A general account is given of the insects which proved to be specially injurious in Minnesota during the year 1903. The author obtained evidence which he considers as proving that there are 2 annual broods of the Hessian fly in Minnesota. In combating this insect the author recommends the usual remedies.

An outbreak of chinch bugs occurred in Stearns County and caused considerable damage. In controlling this pest it is recommended that rubbish be cleaned up and burned and that millet be planted in a narrow strip around cornfields in order to protect the corn. It is also suggested that corn be planted only at some distance from wheat and barley. Notes are given on injuries from grasshoppers, together with a copy of a law passed by the Minnesota legislature regarding the destruction of grasshoppers. A test was made of the Criddle mixture in poisoning grasshoppers, with fairly satisfactory results. Some farmers who have used this mixture report success, while others failed to see any good results from its use.

Notes are also given on the quality of Paris green sold in Minnesota and on a large number of insects injurious to orchards and nurseries. These insects are arranged according to a key for identification, based largely on a scheme proposed by W. Lochhead. The chief features of the inspection laws of various States are mentioned and notes are given on grain plant lice, squash bugs, cutworms, potato beetles, cockroaches, ants, carpet beetles, granary insects, etc. Formulas are also presented for the preparation of the more important insecticides and fungicides.

The monthly bulletin of the Division of Zoology, H. A. SURFACE (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 1 (1904), No. 10, pp. 32, pls. 2*).—Brief notes are given on remedies for the control of San José scale and other injurious insects and plant diseases, together with an account of lime-sulphur-soda wash, and notes on the economic value of birds.

Some entomological notes, F. F. CREVECŒUR (*Ent. News, 14 (1903), No. 2, pp. 47–50*).—Notes are given on the prevalence and distribution of insects in Kansas. The author states that his collection of insects has suffered greatly from the attacks of museum pests. After trying many remedies for these pests the best success was had in fumigation with hydrocyanic-acid gas. The pest which caused most trouble was *Trogoderma tarsale.*

Agricultural pests in the Government of Tomsk in 1902, V. SOLDATOV (*Selsk. Khoz. i Lyesov., 211 (1903), Dec., pp. 600–644*).—The author discusses the influence of rainfall and other climatic conditions upon the prevalence of injurious insects. The insects to which most attention was given in these studies were locusts and various species of cutworms and related Lepidoptera.

The enemies of agriculture, A. L. HERRERA (*Las plagas de la Agricultura. Mexico: Ministerio de Fomento, 1902, pp. 627–705, figs. 27*).—This number completes the author's handbook on the subject of insect and fungus enemies of agriculture, and includes a discussion of the enemies of tobacco, grapes, and rice.

Insect pests of coffee in South India, H. M. LEFROY (*Dept. Agr. India Bul. 2, pp. 19*).—The chief insect pests of coffee in India belong to the family Coccidæ. Some of these pests injure the shade trees of coffee while others attack the coffee plant directly. Among the insects injurious to shade trees of coffee, mention is made of *Pulvinaria psidii, Lecanium imbricans,* and *L. expansum.* The pests of coffee to which chief attention is given are mealy bug, *Lecanium hemisphæricum, L. viride, Xylotrechus quadripes,* and *Zeuzera coffeæ.* Formulas are given for the preparation of kerosene emulsion, resin wash, tobacco and soap washes, and a mixture of lime and sulphur.

A bibliography relating to insects injurious to bark, A. L. Herrera (*Bol. Com. Par. Agr., 2 (1903), No. 3, pp. 104–114*).—The list of articles relating to the subject is largely compiled from *Insect Life* and the entomological bibliographies published by this Department.

The Coccidæ of Ohio, F. M. Webster (*Ent. News, 14 (1903), No. 9, pp. 288–290*).—Brief notes on the species of bark lice thus far described in Ohio, with special mention of the occurrence and distribution of *Eulecanium quercitronis*, *E. fletcheri*, San José scale, and *Aspidiotus ostreæformis*.

The life history of the scale insects of middle and northern Europe, L. Reh (*Allg. Ztschr. Ent., 8 (1903), Nos. 16–17, pp. 301–308; 18–19, pp. 351–356; 20–21, pp. 407–419; 22–24, pp. 457–469*).—This article is in the nature of a monograph of the various species of Coccidæ found in middle and northern Europe. These belong to various genera, including Dactylopius, Orthezia, Kermes, Lecanium, Pulvinaria, Aspidiotus, etc.

Proceedings of the Boll-Weevil Convention in New Orleans (*New Orleans: Bureau Agr. and Immig., 1903, pp. 91*).—A convention for the consideration of the boll-weevil problem was called by Gov. W. W. Heard, and held sessions in New Orleans, November 30 and December 1, 1903. At these meetings a number of speakers took an active part in the discussion, and various papers were presented on different aspects of the boll-weevil problem. The distribution and general economic aspects of the question were discussed by A. Brittin and C. Schuler. J. H. Connell spoke on the prospects of the cooperation of this Department in combating the boll weevil. An account was also given of the spread of the insect and the difficulties to contend with in exterminating it.

W. D. Hunter referred to the work which has already been done by this Department in fighting the boll weevil in Texas. The speaker stated his opinion as being that extermination of this insect is impossible. Attention should be directed to keeping the pest in check by means of proper rotation of crops and cultural methods. The problem of protecting Louisiana against invasion by the boll weevil was discussed by H. A. Morgan. Attention was called to the importance of the fact that in the United States cotton is the only known food plant of the boll weevil. This fact may be made use of in a system of rotation for preventing invasion by the pest. The habits of the insect were described in detail for the purpose of illustrating feasible methods of eradication.

S. A. Knapp referred to the interest manifested by the Secretary of Agriculture in checking the ravages of the boll weevil, and outlined the methods of procedure which have been adopted on demonstration farms. The speaker stated that the results obtained on such farms have been so satisfactory as to induce many other farmers to put the same methods in practice. The legality and constitutionality of proposed legislation for preventing the spread of the boll weevil from Texas into Louisiana were discussed by J. C. Pugh and W. Guion.

The morning session of December 1 was devoted largely to a discussion of the economic importance of the cotton-boll weevil to various commercial interests. The planters' interest in combating the boll weevil was discussed by F. P. Stubbs; the merchants' interest, by J. M. Parker; the bankers' interest, by S. M. Lawrason, and the oil mills' interest, by S. P. Sullivan. The speakers described the injurious effects of the unrestricted spread of the boll weevil upon the development of the various industries.

F. M. Muller read a paper on Birds in their Relation to the Boll Weevil. In this paper attention was called to the importance of birds in controlling the injurious insects and the necessity of protecting the most beneficial birds. Resolutions were adopted calling upon the farmers to exercise unusual precaution in preventing the importation of the boll weevil, urging cordial cooperation with this Department, and

deprecating sensational or unauthorized reports regarding the occurrence of the boll weevil in any new localities. Committees were appointed to investigate the subjects of boll-weevil legislation and bird legislation.

The Mexican cotton-boll weevil, L. O. HOWARD (*Amer. Mo. Rev. of Reviews, 29 (1904), No. 169, pp. 188-191, figs. 4*).—An outline is given of the economic importance of the pest, its habits, life history, and ravages in Texas, and the work of this Department and the State of Texas in combating it. Considerable advantage has been found in the cultivation of an early crop of cotton from northern seed and grown in rows farther apart than has heretofore been the custom. In the author's opinion it will be impossible to stop the distribution of the pest into various parts of the country where cotton is grown, but the hope is expressed that its ravages may be largely controlled by proper insecticide and cultural methods.

The cotton-boll worm (Heliothis armigera), F. SHERMAN, Jr., (*North Carolina Dept. Agr., Ent. Circ. 2, pp. 6, fig. 1*).—Notes on the habits, life history, injuries, and means of combating this species.

The Hessian fly, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 1, pp. 4, fig. 1*).—In North Carolina there are said to be 2 complete annual generations of this insect. The remedies recommended consist in late planting, burning or plowing under the stubble, and the use of a trap crop of early wheat.

Locusts and grasshoppers, W. W. FROGGATT (*Agr. Gaz. New South Wales, 14 (1903), No. 11, pp. 1102–1110, pl. 1*).—Descriptive and economic notes on a number of locusts belonging to the genera Locusta, Acridium, Cyrtacanthacris, etc.

The present condition of the San José scale in Ontario, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Bul. 133, pp. 8, figs. 5*).—This pest first appeared in Ontario about 7 years ago and has been fought assiduously with the result that the problem of controlling it appears simpler at the present time than ever before. Good results have been obtained from the use of various insecticides, and the author recommends these insecticides in the following order of effectiveness: Lime-sulphur-salt mixture, crude petroleum, crude petroleum and whale-oil soap emulsion, whale-oil soap solution, carbolic wash. While these remedies are all effective they are not all equally inexpensive. The whale-oil soap solution proved to be too expensive for large orchards. The lime-sulphur-salt solution apparently killed all the San José scale and was also effective against scurfy bark-louse and oyster-shell bark-louse. Two preparations of carbolic wash were used, one for winter and one for summer applications. This wash appears to be valuable in controlling the plant lice on apple, plum, cherry trees, and also as a fungicide in the control of peach-leaf curl, apple scab, brown rot of plums, etc.

Orchard studies.—XIV. The lime-sulphur wash, W. B. ALWOOD and J. L. PHILLIPS (*Virginia Sta. Bul. 141, pp. 215–246, figs. 17*).—The various formulas recommended by different investigators for the preparation of the lime-sulphur-salt wash are presented in tabular form. From a study of these tables it appears that in 100 gal. of the mixture the quantity of lime varies from 15 to 66 lbs., sulphur from 15 to 33 lbs., and salt from 16 to 25 lbs., while the time of boiling varies from 40 minutes to 3 hours. The authors attempted to determine the chemical composition of the compound for the purpose of reducing the system of its preparation to a definite chemical basis.

The objections raised by horticulturists against the use of this insecticide are that so much apparatus is required in its preparation and that the length of time required for boiling it is so long. In the first experiments made by the authors the formula used was as follows: 50 lbs. lime, 50 lbs. sulphur, and 12½ lbs. salt per 100 gal. of water. Several modifications of this formula were also tested and the period of boiling was varied to considerable extent. Tests were made of the specific gravity of mixtures of various strengths; during these experiments it was found that the

specific gravity varied from 1.001 to 1.071. A formula containing 25 lbs. lime, 20 lbs. sulphur, and 2½ lbs. sulphate of copper per 100 gal. water gave excellent results. As a result of these tests and other experiments with this mixture the author recommends in general the following formula: Lime 30 lbs., sulphur 30 lbs., salt 10 lbs., water 100 gal. As a winter wash the author recommends 2 treatments, one in November or December and the other in February or March.

Experiments were also made in applying this mixture to the trunks and branches of trees in July, August, and September. As a result of these experiments the author recommends lime-sulphur wash as a summer treatment for apple trees, and believes that it may prove safe for peach and other fruit trees.

Lime, sulphur, and salt wash for San José scale, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 5, pp. 8*).—Brief notes are given on the formulas used in the preparation of this insecticide, extent of the application of the wash in North Carolina, and directions for preparing and applying it.

Some recent spraying experiments, W. M. SCOTT (*Proc. Georgia State Hort. Soc., 27 (1903), pp. 86–97, figs. 4*).—Notes on the application and effectiveness of lime-sulphur-salt wash as a winter and spring spray, and also of the lime-sulphur-bluestone wash. Notes are also presented on the value of these washes and Bordeaux mixture in the control of peach-leaf curl.

The codling moth, J. LANG (*Jour. Dept. Agr. Victoria, 2 (1903), No. 1, pp. 58–60*).—According to the author's experience there are 2 broods of the codling moth per annum in Australia. The author calls attention to the necessity of clean cultivation and destruction of rubbish in combating this insect, and recommends spraying with Paris green at the rate of 1 lb. to 160 gal. of water to which 6 lbs. of lime have been added.

Pigs for the destruction of codling moth larvæ, J. BRODERICK (*Agr. Gaz. New South Wales, 14 (1903), No. 11, p. 1077*).—The author reports excellent results in the destruction of the larvæ of the codling moth and the prevention of injury from this insect by allowing pigs to remain in the orchard during the whole season.

The round-headed apple-tree borer, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 3, pp. 5, fig. 1*).—In combating this species the author recommends digging out the larvæ, mounding the trees, and using certain protective devices, bands, etc.

Notes on the early stages of Corylophodes marginicollis, A. W. MORRILL (*Ent. News, 14 (1903), No. 5, pp. 135–138, pl. 1*).—This insect is reported as occurring on the leaves of horse-chestnut trees. The larvæ and adults were found feeding upon a fungus which grows on the under side of horse-chestnut tree leaves and which was identified as *Uncinula flexuosa*. The insect is described in its various stages and brief notes are given on its distribution.

The resin-gnat Diplosis and three of its parasites, LIDA S. ECKEL (*Ent. News, 14 (1903), No. 9, pp. 279–284, pl. 1*).—Pine trees in the vicinity of Woods Hole are said to be extensively infested with *Diplosis resinicola*. The habits of this insect are mentioned and a description is given of the insect in its various stages. Notes are also given on 3 parasites of this insect, including a form which is described as a new species under the name *Syntasis diplosidis*.

A subterranean root-infesting fulgorid, H. OSBORN (*Ohio Nat., 4 (1903), No. 2, pp. 42–44*).—The author describes as new under the name *Myndus radicis* a species of Fulgoridæ found upon the roots of several kinds of plants, including grasses. Notes are given on the habits of this insect and upon its possible economic importance.

Contributions to the life history of Gelechia nanella from an economic point of view, J. T. HOUGHTON (*Ent. Mo. Mag., 2. ser., 15 (1903), No. 165, pp. 219–221*).—The larvæ of this insect were observed mining in the leaves of apricots and boring into the leaf buds. The burrows thus produced were lined with silk. The species

usually infests pear trees, but was observed on apricots, peaches, cherries, plum, and apple trees. The insect is described in its various stages.

The dorsal glands of the larvæ of Heteroptera, J. Gulde (*Ber. Senckenberg. Naturf. Gesell. 1902, pp. 85–132, pls. 2*).—A large number of species are considered in this study and the anatomical structure and function of the dorsal glands in these different species are studied in a comparative manner. These glands are believed to serve the same function as the dermal glands in cockroaches and the defensive glands of myriapods.

The light organs of native Lampyridæ, J. Bongardt (*Ztschr. Wiss. Zool., 75 (1903), No. 1, pp. 1–45, pls. 3, figs. 4*).—The author made a detailed study of the anatomy and physiology of the phosphorescent organs in insects of the family Lampyridæ, especially *Lampyris noctiluca*. The light organs were removed and subjected to the action of drying, heat, and various gases. It was found that these organs continued to emit light for periods of several days, even when subjected to the influence of inert gases, such as carbon dioxid and hydrogen. The luminosity of the organs, however, soon ceased when these gases were passed over in a constant stream. It is concluded therefore that the cessation of the production of light is not due to the influence of the inert gas of itself, but to the action of the gas in motion.

Urticating larval hairs, E. A. Cockayne (*Entomologist, 36 (1903), No. 483, pp. 201–203*).—A brief reference is made to a considerable number of species of Lepidoptera in which the larvæ bear stinging hairs.

The plum webbing sawfly, H. T. Fernald (*Ent. News, 14 (1903), No. 9, pp. 298–302*).—Notes are given on the habits and life history of *Lyda rufipes* and the insect is described in its various stages. The hibernating larvæ pupate in March below the roots of grasses. The length of the feeding period is from 26 to 30 days. This insect has thus far not occurred in large numbers about Amherst, but it is believed that should it become abundant it would cause considerable damage to plum trees.

Destruction of the winter eggs of phylloxera by means of lysol, G. Cantin (*Jour. Agr. Prat., n. ser., 7 (1904), No. 4, pp. 127, 128*).—The author reports excellent results in the destruction of phylloxera from the use of lysol. This remedy was applied to the trunks of grapes in a 4 or 5 per cent solution. Grapevines thus treated bore good crops of fruit, while control vines situated under the same conditions died within a season or two.

A new oak-tree pest, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 23 (1903), No. 6, pp. 655–658, pl. 1*).—The author describes *Phylloxera corticalis* as a new pest of oaks in South Africa, where the number of insect pests of the oak is exceedingly limited. This fact is apparently due to the introduction of seed for raising oaks, thus preventing the simultaneous introduction of oak pests. The species described in the article is considered perhaps the most injurious of the oak pests of South Africa. In some instances it almost entirely covers the bark and causes the weakening or destruction of the trees. Among the natural enemies of this pest the author mentions a ladybug (*Exochomus nigromaculatus*).

A knowledge of certain forms of Pieris napi, F. Wagner (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 53 (1903), No. 3–4, pp. 174–178, pl. 1*).—Notes are given on the variations in color pattern observed in the males and females of *Pieris napi*, especially in forms usually referred to as *sulphurea* and *sulphureotincta*.

Sirex, H. Faes (*Chron. Agr. Canton Vaud, 16 (1903), No. 23, pp. 644–647, figs. 3*).—Notes on the habits, life history, and means of combating *Sirex juvencus* and *S. gigas*.

Help notes toward the determination of British Tenthredinidæ, F. D. Morice (*Ent. Mo. Mag., 2. ser., 15 (1903), Nos. 157, pp. 9–14; 159, pp. 53, 54; 161, pp. 114–119; 164, pp. 187–193; 166, pp. 242–245, figs. 9*).—The author presents an account of the more important anatomical characters of this family of insects for the purpose

of furnishing convenient means for separating the various species. A synoptic table is also given to assist in the identification of the genera of this family occurring in Great Britain.

The life history of Vanessa antiopa, F. W. Frohawk (*Entomologist, 36 (1903), No. 476, pp. 2-5*).—Brief notes on the life history and habits of this insect in its various stages.

The destruction of fruit pests, A. H. Benson (*Queensland Agr. Jour., 13 (1903), No. 6, pp. 538–553, pls. 4*).—Directions are given regarding suitable kinds of spraying apparatus and methods of applying spraying materials. Notes are also presented on various insect and fungus pests together with directions for the preparation and use of Paris green, kerosene emulsion, resin wash, lime-sulphur-salt, whale-oil soap, sulphur, Bordeaux mixture, and ammoniacal copper carbonate. The author also describes the apparatus which is necessary for use in fumigating orchards with hydrocyanic-acid gas, and presents a table showing the amount of materials to be used on trees of different sizes.

Insecticides and their use, J. B. Smith (*New Jersey Stas. Bul. 169, pp. 27*).—In this bulletin the author discusses the use and effectiveness of insecticides in general, and presents special notes on the preparation and use of Paris green, green arsenoid, London purple, arsenite of lime, arsenate of lead, Bordeaux mixture, poisoned bait, lime-sulphur-salt, lime-sulphur-soda, sulphid of potash and lime, crude petroleum, soap washes, whale-oil soap, lime, tobacco, sulphur, pyrethrum, carbolic acid, sulphur, and bisulphid of carbon.

Spraying apparatus, F. Sherman, Jr. (*North Carolina Dept. Agr., Ent. Circ. 4, pp. 7, figs. 4*).—General recommendations are given concerning kinds of pumps, nozzles, and other insecticide apparatus which should be used in practice.

Rules and regulations of the Board of Horticulture of British Columbia, J. R. Anderson (*Victoria, B. C.: Bd. Hort., 1903, pp. 7*).—A copy is given of the rules and regulations of the Board of Horticulture made according to the Horticultural Board Act. Notes are given on the treatment of nursery stock, together with recommendations on the methods of preparing and applying various insecticides.

Suggestions to purchasers of nursery stock in North Carolina, F. Sherman, Jr. (*North Carolina Crop Pest Com. Circ. 5, n. ser., pp. 9*).—Notes are given on the duties of the inspector and on the proper form of certificate, and buyers are warned against purchasing trees infested with fungus and insect pests. Notes are also given on the proper care in cultivating and spraying trees in order to prevent injury from such pests.

Examination of "Nature's Wonder" fertilizer-insecticide, G. E. Colby (*California Sta. Rpt., 1902–3, p. 93*).—An examination of this substance, which was claimed to be both a fertilizer and an insecticide, showed that it is harmless to insects and that its fertilizing value is very slight.

Notes on the insecticide use of the gasoline blast lamp, S. A. Forbes (*Illinois Sta. Bul. 89, pp. 145-154*).—The literature relating to the use of the gasoline blast lamp in the destruction of insects is briefly reviewed. It appears that this apparatus has been used in combating harlequin cabbage bug, San José scale, cotton-boll weevil, aster beetles, chinch bugs, scale insects, caterpillars, fungus diseases, etc.

A number of experiments were made, and a report is given upon the same, by E. S. G. Titus. It appears from these experiments that a modified form of gasoline torch, very similar to the ordinary plumber's torch, when under the greatest possible pressure gives a flame with sufficient heat to singe hair at a distance of 10 to 12 in. The effect of this heat was tested on scurfy scale, Forbes scale, woolly aphis, fall webworms, meadow moths, various caterpillars, including cabbage worms, etc., and also on lilac mildew. At the same time tests were made to determine the tolerance of the leaves of various plants for the heat of the torch applied for varying periods.

Mr. Titus concludes from his experiments that "the use of sufficient heat to destroy effectually insect larvæ of the kinds we treated will injure the foliage and often the twigs." The author suggests, however, that this remedy may have a limited field of usefulness in the destruction of San José scale, chinch bugs, and other species of injurious insects.

Carbon bisulphid as an insecticide, J. H. BEATTIE (*Agr. Student, 10 (1904), No. 4, pp. 69–71*).—A brief discussion is presented of the chemical nature and behavior of carbon bisulphid, together with notes on its application in the destruction of injurious insects, especially in buildings.

Instructions for the use of carbon bisulphid as an insecticide, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 1, pp. 9–12*).—The nature and chemical properties of this insecticide are briefly outlined and instructions are given for using it for destroying insects in the soil, granaries, storehouses, dwellings, etc.

Potash soaps as insecticides, A. L. HERRERA (*Com. Parasit. Agr. [Mexico], Circ. 2, pp. 3*).—Brief notes on the composition of different potash soaps, together with formulas for the preparation of emulsions from these soaps and kerosene and the use of such emulsions as insecticides.

The commercial cultivation of pyrethrum as an insecticide in Southern France and in Algeria, H. BLIN (*Bol. Sec. Agr. Bahia, 2 (1903), No. 4, pp. 279–283*).—Notes are given on the cultivation of various species of pyrethrum and on the harvesting and care of the crop in such a manner as to obtain the greatest insecticide value. The amount of dry powder obtained from each hectare varies from 500 to 900 kg., according to the soil conditions and varieties of pyrethrum cultivated. Brief mention is made of the insecticide power of different varieties of pyrethrum.

A new method of combating insects in houses and granaries, P. LESNE (*Jour. Agr. Prat., n. ser., 6 (1903), No. 53, pp. 857–861, figs. 2*).—A description is given of an apparatus devised in the United States especially for the disinfection of ships, granaries, and storehouses. In this apparatus sulphur is subjected to a temperature of 600 to 700° C.; the gas thus produced is cooled by passing through pipes surrounded with cold water. The gas is found to contain traces of SO_3 along with SO_2. The amount of these gases in an atmosphere treated by means of the apparatus described by the author may reach 14 to 15 per cent. When sulphur is burned in the free air the percentage of these gases in the room does not exceed 4 or 5 per cent. The unusual effectiveness of the gas mixture obtained by this apparatus in the destruction of rats, other injurious mammals, and insects is attributed to the action of SO_3. While the gas mixture is exceedingly destructive to animal life, it appears to be quite harmless in its effects upon fruits, cereals, grains, and ordinary fabrics.

The Mediterranean flour moth, G. H. CARPENTER (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1903), No. 4, pp. 715–720, pl. 1*).—The moth is described in its various stages and notes are given on its distribution and life history. The remedies recommended for the destruction of the insect are steaming, fumigation with sulphur and with carbon bisulphid.

The effect of poisons upon Lasius emarginatus, R. COBELLI (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 53 (1903), No. 1, pp. 18–21*).—Experiments were made in feeding this species of ant upon honey containing solutions of various alkaloids. It was found during these experiments that the ants, without showing any symptoms of poisoning, could eat honey containing solutions of atropin, belladonna, cocaine, morphin, opium, codein, pilocarpin, nux vomica, aconite, digitalis, veratrin, colchicum, strychnin, or Fowler's solution of arsenic.

Ants, green fly, and scale, BONAVIA (*Jour. Roy. Hort. Soc. [London], 28 (1903), pt. 1–2, pp. 84, 85*).—The author discusses the relationship between ants and insects which they attend, such as aphides and scale insects. It is urged that further inves-

tigations should be made in order to determine the exact biological relation between these insects and also to determine effective means for preventing ants from visiting trees infested with plant lice and scale insects.

White ants in orchards, plantations, and fields, A. N. PEARSON (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 21, pp. 777, 778*).—In controlling infestation by white ants the author recommends that the soil should be treated before setting out orchards. For this purpose arsenical poisons and bisulphid of carbon give good results. The same insecticide methods may be used after trees have been planted. It is suggested that in planting sugar cane the seed pieces may be dipped in a material distasteful to the ants—for example, asafetida, mustard-oil cake, petroleum, etc.

The mound-building prairie ant, G. A. DEAN (*Industrialist, 30 (1904), No. 15, pp. 227–238, figs. 6*).—The author describes the various details of the galleries, passages, and other features in the construction of the nests of *Pogonomyrmex occidentalis*.

The hibernation of ants, R. COBELLI (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 53 (1903), No. 7, pp. 369–380*).—A study was made of the hibernation of a number of species of ants, including *Lasius fuliginosus, L. emarginatus, Cremastogaster scutellaris, Camponotus pubescens*, etc. The relationship of these ants to various plant lice was also studied. It was found that the differences in the length and other features of the hibernation period were due largely to specific differences in the ants, especially their resisting power toward cold.

Contribution to a knowledge of Anopheles, W. DÖNITZ (*Ztschr. Hyg. u. Infectionskrank, 43 (1903), No. 1, pp. 215–238, figs. 7*).—Descriptive and biological notes are presented on a number of species of Anopheles, with special reference to such anatomical structures and habits as may be used in differentiating the various species.

The location of the larvæ of Anopheles in Algeria, EDMUND and ÉTIENNE SERGENT (*Ann. Inst. Pasteur, 17 (1903), No. 11, pp. 763–769*).—The larvæ of Anopheles become located in canals, pools of water, ponds, under vegetation, etc., but the adult mosquitoes may be carried to considerable distances away from the breeding grounds. Notes are given on the usual methods recommended for combating the mosquito nuisance.

Note on the use of kerosene as a culicide, ST. G. GRAY (*Jour. Trop. Med. [London], 6 (1903), No. 20, pp. 313, 314, fig. 1*).—In the author's experience kerosene proved a valuable remedy in destroying mosquitoes in pools. It was found, however, that only a small proportion of the adult mosquitoes were killed while depositing their eggs on the surface of water covered with kerosene. The author suggests that a larger percentage of egg-laying females might be destroyed by the use of crude petroleum.

A breeding cage, J. C. DOLLMAN (*Ent. Rec. and Jour. Variation, 15 (1903), No. 1, p. 7, pl. 1*).—The author presents a description of a breeding cage for insects, which is recommended on account of its simplicity, cheapness, and efficacy. The advantages of this form of breeding cage are briefly described.

How shall we arrange our collections? H. T. FERNALD (*Ent. News, 14 (1903), No. 4, pp. 108–110*).—The author presents a discussion of this question with reference to the practical requirements of systematists and economic workers in showing collections. The conclusion is reached that since the true phyletic relationship between different groups of insects has not been established, it is impossible to arrange collections strictly according to a natural system of classification. In some respects such an arrangement is, in the author's opinion, unsuitable for an economic entomologist.

The biology of the honeybee, VON BUTTEL-REEPEN (*Allg. Ztschr. Ent., 8 (1903), No. 22–24, pp. 453–457*).—A controversial article in which it is argued that the evidence upon which N. Kulagin relied in concluding that the drones and workers arise from half-fertilized eggs is unsatisfactory.

The biology of bees, N. KULAGIN (*Allg. Ztschr. Ent., 8 (1903), No. 20-21, pp. 395-397*). During the experiments reported in this paper the author placed colonies of bees in hives which contained bee cells, with drone cells in 1 frame only. Observation of the queen bee disclosed the fact that she laid eggs in the drone cells at 3 different times. Brief notes are also given on the cause of swarming and on the production of honeycomb. The author found that the bees produced comb from the wax with which they were furnished, and that the form of the cell was not determined voluntarily by the bees, but was due to the method of construction of the comb.

The relation of bees to fruit growing, W. NEWELL (*Proc. Georgia State Hort. Soc., 27 (1903), pp. 58-63*).—The author maintains that the pollination of the Florida fruit trees is practically impossible without insects, and that the honeybee accomplishes this more successfully than any other insect. With regard to the relationship of bees to pear blight and brown rot it is admitted that these diseases are carried by bees to some extent, but it is argued that their prevalence would be almost if not quite as great without the agency of bees.

A study of parthenogenesis of drones by the statistical method, P. BACHMETJEW (*Allg. Ztschr. Ent., 8 (1903), No. 2-3, pp. 37-44, fig. 1*).—The author collected statistics relating to the anatomical features of drones, especially the length of the wings. These statistics are tabulated. From a study of the statistics it appeared that the right wing of drones and the left wing of workers are products of parthenogenesis, while the left wing of drones and the right wing of workers are the result of fertilization of the eggs of the queen. It is concluded, therefore, that the worker bees and drones are half-normal individuals which develop from half-fertilized eggs.

The stingless bees of North and South America considered in the light of domestication, R. H. HARRIS (*Ent. Rec. and Jour. Variation, 15 (1903), No. 4, pp. 99, 100*).—A brief reference is made to the characters and relative value of *Aphis dorsata* and *A. mellifica*. The author states that species of the genera Melipona and Trigona are decidedly inferior to the common honeybee. These latter bees build nests in various locations, including the nests of termites. No wax is used in the construction of the nests. The honey of these bees is also greatly inferior to that of the common honeybee. It is argued, therefore, that little return can be expected from the domestication of these species.

How to prevent foundation falling out of frames, H. R. STEPHENS (*Queensland Agr. Jour., 13 (1903), No. 6, p. 568, fig. 1*).—A method is described and illustrated by which the foundation may be prevented from falling down under the weight of a cluster of bees. The method consists in the use of double lines of wire, one on either side of the frame.

Experiments in sericulture in Tunis, F. VERRY (*Bul. Agr. Algérie et Tunisie, 9 (1903); No. 22, pp. 500-507*).—The eggs used by silkworm raisers in Tunis have been largely furnished by the French government and belong to a number of varieties obtained from the Alps and China. Notes are given on the reeling properties, purity, and tenacity of the silk obtained.

Report of the inspector for the silk commission, GUYOT (*Ann. Soc. Agr. Sci. et Ind. Lyon, 7. ser., 10 (1902), pp. 73-75*).—A brief description is given of the agricultural operations in the vicinity of Lyons, and attention is called to the possibility of extending the silk industry with profit.

FOODS—NUTRITION.

The increase of soluble matter in bread by toasting, E. W. HILGARD (*California Sta. Rpt. 1902-3, pp. 100, 101*).—The changes brought about in bread by toasting were studied with samples toasted very thoroughly; prepared by the ordinary house-

hold method, that is, toasted only on the surface; and samples dried for a long time at 100° C. The results of analyses made by G. E. Colby follow:

Changes due to the different methods of toasting bread.

Kind of toast.	Loss in weight on toasting.	Material soluble in water.	Material insoluble in water.	Albumen in soluble portion.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Bread heated 1 hour at 100° C	34.70	12.62	87.38	1.70
Light-colored (yellow) toast made at 150° C	35.30	12.45	87.55	
Brown-toast made at 170° C	36.07	26.14	73.86	.91
Dark-brown toast made at 174° C		25.50	74.50	
Brown toast made at about 160° C. by household method		21.77	78.23	[a]1.90

[a] Bread made with milk, therefore the albumen is not directly comparable with other samples.

It is commonly believed that toast is more digestible than bread, and the superior digestibility has been attributed to the sterilization of the toast and the increased solubility of the carbohydrates present. While this might hold good for thoroughly toasted bread, the author does not believe that such is the case with toast as made by the ordinary household method, since this is only browned delicately on both sides. The toasting penetrates only to a very slight depth, ordinarily on the two sides together hardly more than a millimeter, and when it is carried only to the delicate yellow stage the increase in soluble matter will be insignificant and the soft interior of the slice will be no more sterilized than it was in the baking of the bread. In the author's opinion the increased digestibility of toast may be accounted for by the supposition that its agreeable flavor stimulates the digestive secretions.

A study of some ancient breads, L. Lindet (*Compt. Rend. Acad. Sci. Paris, 137* (*1903*), *No. 17, pp. 664–666*).—A summary of some earlier work on this subject, and a brief report of the author's examination of bread from Egypt and Roman bread from Aosta.

Botanical and chemical examinations of prehistoric grains from ancient tombs.—I. Concerning the gluten cells and their distribution in grain, C. Brahm and J. Buchwald (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 1, pp. 12–19, figs. 4*).—Microscopical studies of emmer (*Triticum dicoccum*) from an Egyptian tomb of the 18th dynasty (about 1700 B. C.) showed that neither the starch-free cells of the endosperm nor the remaining cells contained aleurone grains or fine plasma grains, but contained gluten in a structureless homogeneous form. The peripheral cells contained minute starch grains and the inner cells contained both large and small grains, the starch being imbedded in the gluten in all cases. When warmed these starch grains exhibited the striated structure and possessed all the properties of fresh starch. It was found that wheat kernels dried for 48 hours at a temperature of 104° C. and 55 mm. atmospheric pressure closely resembled in structure the old Egyptian grains.

Hygienic studies of flour and bread.—XII. Contribution to the bacteriology of spontaneous and leaven fermentations, F. Levy (*Arch. Hyg., 49* (*1904*), *No. 1, pp. 62–112*).—The various forms of bacteria found in sour dough have been classified by Lehmann and Wolffin as forms of *Bacterium levans*, in addition to *B. coli* which was generally recognized as present. The author of this paper has found from his studies that the bacteria all fall under *B. coli*, and he has rearranged the grouping on this basis, recognizing in addition to the typical species 2 conspicuous forms.

From his experiments, reported in full, the conclusion is reached that in the case of spontaneous fermentation and fermentation caused by leaven, *B. coli albidoliquefaciens* and *B. coli luteoliquefaciens* were present, in addition to a typical *B. coli*, all 3

of which produced an abundance of gas and acid. A light yellow organism very similar to *B. coli* was also found which caused liquefaction and formed weak acid, but produced no gas. In the spontaneous fermentation of dough porosity can be and is in practice, brought about by 3 of these gas-forming organisms. When leaven is used as a fermenting agent the bacteria named may be present, but yeast is the principal active agent. Acid is formed only in limited amounts by the organisms named. The most important of the acid-building organisms were pointed out by W. Holliger.[a]

Concerning wheat and wheat flour, I, T. Kosutány (*Jour. Landw., 51 (1903), No. 2, pp. 139-161*).—The estimation and properties of gluten were studied, as well as gluten formation in sprouting grain. The results of baking tests with different sorts of gluten were also briefly noted. The author concludes that glutenin is the anhydrid of gliadin, and conversely that gliadin is a hydrated form of gluten, and believes that the change of one into the other may be induced, and that such a change explains some of the well-known phenomena connected with milling and baking. Concerning these points he makes in effect the following statements:

Flour from new wheat produces a heavy dough; however, when the wheat or flour has stood for a number of weeks normal dough is produced. When the flour or wheat is several years old the dough produced is short and crumbly. It is considered probable that the amount of protein does not change, but that at first gluten predominates, and that it gradually loses water and is converted into glutenin. When dough is allowed to stand, especially in a warm place, it becomes softer, as the author has shown by a number of experiments with various viscometers. This change he explains is due to the formation of gliadin from glutenin by the addition of water.

Dough from sprouted wheat is flat and heavy, the reason being in the author's opinion that by the action of a hydrolizing enzym glutenin has been converted into gliadin. When a clear solution of gliadin in 70 per cent alcohol is allowed to stand for several weeks a precipitate is formed which the author believes is due to the fact that gliadin splits off water and forms glutenin. When gluten is allowed to stand for some days in water it adds water chemically and becomes soluble in alcohol, that is, gliadin is formed. Using the same flour somewhat less gluten is obtained by the aid of warm than of cold water, and the gluten is softer and more sticky. Hard water gives more elastic and more abundant gluten than soft water. When grain is ground care must be taken to prevent the heating of the flour and consequent deterioration. The changes noted in such cases are due, according to the author, to the evaporation of combined water and to oxidation. After a time heated flour improves in quality probably owing to reduction and absorption of water in chemical combination. The changes observed in the quality of flour when stored are regarded as dependent upon the atmospheric moisture and temperature.

The author considers that Hungarian flour yields more bread than many other flours, 100 kg. of such flour producing 145.66 kg. of bread in an average of 150 tests. As an average of more than 300 analyses Hungarian wheat was found to contain 15.346 per cent gluten or somewhat more than the average of a large number of analyses of other sorts. The effects of climate on the character of the wheat crop are briefly spoken of.

Concerning wheat and wheat flour, II, T. Kosutány (*Jour. Landw., 51 (1903), No. 4, pp. 329-353, pl. 1, figs. 3*).—Using a modification of Rejtö's instrument for studying density, studies were made with dough and conclusions drawn, which are based on the form assumed by the dough as shown by a diagrammatic cross section. This method, the author believes, furnishes data for judging of the character of the gluten of the wheat, the relative proportion of gluten and gliadin, the purity of the flour, the best method of manipulation in bread making, etc.

[a] Centbl. Bakt. u. Par., 2. Abt., 9 (1902), pp. 305-312, 361-371, 395-425, 473-483, 521-537.

The deterioration of meat, H. MARTEL (*Principales altérations des viandes. Paris: C. Naud, 1902, pp. 22*).—In this article, which is a reprint from *La Presse Médicale, 1902, No. 52,* animal parasites, bacterial contamination of meat, prophylaxis, and related subjects are discussed.

Methods of judging meat extracts, I, F. KUTSCHER and H. STEUDEL (*Ztschr. Physiol. Chem., 38 (1903), No. 1–2, pp. 101–110*).—Like other investigators, the authors note the occurrence of succinic acid in meat extract. Its relation to the purity of this product is briefly discussed.

Cream as food (*Bul. Iowa State Bd. Health, 17 (1903), No. 4, p. 62*).—Data regarding the dietetic value of cream are summarized. Cream as a fat-supplying food is regarded as especially valuable on account of its mechanical condition and the association of proteid material with the fat. Its value in invalid dietectics is also spoken of.

Analyses of breakfast foods, G. W. SHAW (*California Sta. Rpt. 1902–3, pp. 86–88*).—Analyses of 6 samples of commercial breakfast foods are reported and briefly discussed.

The source of the important foods used in Halle, K. GRABENSTEDT (*Inaug. Diss., Univ. Halle, 1903, pp. 64*).—The author has gathered statistical and other information regarding the food supply of the city of Halle.

Cowpeas, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 5, pp. 10*).—The importance of cowpeas in the diet is briefly discussed, and 25 recipes are given for preparing them in various ways for the table.

Colored legumes, K. LENDRICH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 1, pp. 1–5*).—The results of examinations made with a view to detecting added coloring matter and material used for facing are reported of unshelled peas and whole and split shelled peas.

Lentils, L. IRWELL (*Dietet. and Hyg. Gaz., 20 (1904), No. 1, pp. 6–9*).—A descriptive article.

Famine foods, D. N. PATON and J. C. DUNLOP (*Edinburgh, 1903, pp. 27; rev. in British Med. Jour., 1903, No. 2245, pp. 94, 95*).—A considerable number of seeds and other products from uncultivated plants used by the Bhils in India during the recent famines are described and analyzed. On the basis of the data reported their food value is discussed.

Esculent tubers and vegetables in Liberia, E. LYON (*U. S. Consular Rpts., 74 (1904), No. 281, p. 407*).—Tubers and garden vegetables commonly eaten in Liberia are enumerated and briefly described.

Italian chestnuts and chestnut trees, P. CUNEO (*U. S. Consular Rpts., 74 (1904), No. 281, p. 408*).—Brief statements regarding the use of chestnuts as food in Italy, and concerning budding chestnut trees.

An Arab food, "Halwa" (*Nature [Paris], 31 (1903), No. 1565, p. 398*).—The manufacture of Halwa, of which large quantities are consumed in the East, is briefly described. This food is a paste made of 3 or 4 parts sugar, 0.5 to 1 part butter, and 0.25 part starch, flavored with a small amount of an aromatic substance resembling essence of rose in odor.

The cooking of shellfish (*British Med. Jour., 1904, No. 2248, p. 265*).—Sterilizing small shellfish with steam as a method of preventing the communication of disease to man was studied. The results obtained were fairly satisfactory. The fact is recognized that if overcooked the palatability of the shellfish is lessened. There is less danger of overcooking with steaming than with boiling. "There can be no doubt that if the retailers of cooked shellfish can be induced to substitute steaming for boiling—or rather for scalding—in the cooking of shellfish for sale, there will be a distinct gain in public safety."

The art of home candy making, M. A. PEASE (*Canton, Ohio: Pease & Smith, 1903, pp. 80*).—A large number of receipts for making candy are given, the methods

outlined, it is stated, being those followed by professional candy makers. The recipes are prefaced by a description of the tools required, data regarding the use of the thermometer in candy making, and other general matters. The work also contains a discussion of cake making and a few recipes.

Examination of marmalades, K. WINDISCH (*Ztschr. Ver. Deut. Zuckerind., 53 (1903), pp. 363–371; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 23, p. 1127*).—The composition of several sorts of jam and marmalade is reported.

Composition and manufacture of jams and marmalades, A. HERZFELD (*Ztschr. Ver. Deut. Zuckerind., 53 (1903), pp. 405–426; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 23, pp. 1123–1127*).—Analyses of a large number of jellies, jams, and marmalades of British and German manufacture are reported.

Composition of almond pastes for macaroons, pastries, bonbons, etc., G. E. COLBY (*California Sta. Rpt. 1902–3, pp. 96, 97*).—Analyses are reported of 3 sorts of almond paste and of California and foreign-grown almond kernels. Some data are also recorded regarding bitter almonds, peach-pit kernels, and apricot-pit kernels. The latter, it is stated, yield a fine grade of oil, which is often used in confectionery. The almond pastes, it appeared, were made of ground almonds with water and sugar, and in one case a considerable quantity of cornstarch.

Olives and olive oil in France, R. P. SKINNER (*U. S. Consular Rpts., 72 (1903), No. 274, pp. 403–421, figs. 3*).—The French olive and olive-oil industry is described.

Examination of brine from pickled olives from Spain, G. E. COLBY (*California Sta. Rpt. 1902–3, pp. 92, 93*).—A number of samples of brine from pickled olives were analyzed, with the following results: Total solids, 8 per cent, of which 5.88 per cent was soluble in water after drying, 0.2 per cent insoluble after drying, and 1.92 per cent organic matter. The soluble part consisted of 91.3 per cent common salt, together with small quantities of sodium sulphate and magnesium chlorid. The insoluble part consisted of calcium and magnesium carbonates, with a small amount of calcium sulphate. No boric acid, salicylic acid, benzoic acid, or niter was found.

This examination showed that the brine was substantially a 5.5 per cent solution of common salt. There was no evidence that any aromatic principle had been employed, except, perhaps, laurel leaves.

Comparative solubility of aluminum and tin in lemon juice, G. E. COLBY (*California Sta. Rpt. 1902–3, pp. 91, 92*).—A sample of lemon juice, which had been extracted from the fruit in an aluminum vessel, was found to contain 0.35 part aluminum and 0.28 part tin per 10,000. The value for aluminum was corrected, the author states, by a proper allowance for alumina present in the natural lemon juice. Though the amounts of dissolved metals are very small, yet the use of the metallic vessel, in the author's opinion, should be avoided for the work in question, a porcelain or porcelain-lined vessel being preferable.

[Soluble] coffee (*Spice Mill, 26 (1903), No. 11, pp. 363, 364*).—A recently introduced coffee product is described, which is said to consist of roasted coffee freed from all the bitter chaff and very finely ground with sugar. This material, it is said, is quite soluble, and it is claimed that coffee may be prepared from it for the table with boiling water without additional cooking.

The manufacture of chocolate and other cacao preparations, P. ZIPPERER (*London: E. & F. N. Spon, Ltd.; New York: Spon & Chamberlain, 1902, 2. ed., pp. X+277, pls. 3, figs. 84*).—This is an English edition of a publication previously noted (E. S. R., 13, p. 1101).

What shall we eat? A. ANDREWS (*New York: The Health Culture Co., 1903, pp. 119, fig. 1, charts 3*).—This volume summarizes in a popular way data regarding the composition and digestibility of food and related topics.

The sale of food and drugs acts, W. J. BELL, H. S. SCRIVENER, and C. F. LLOYD (*London: Butterworth & Co., 1903, 4. ed., pp. XLIV+276*).—The decisions of British

courts rendered since the last edition of this work have been included, and the authors state that the whole volume has been carefully revised.

Report of work in food laboratory, H. E. Barnard (*New Hampshire Sanitary Bul., 2 (1904), No. 1, pp. 5–16*).—The work of the New Hampshire food laboratory carried on under the provisions of the State Pure Food Law is briefly described. Of the 549 samples examined 172, or 31.3 per cent, were found to be adulterated. The article is followed by the food standards and definitions decided upon by the State board of health.

Eighteenth Annual Report of the Ohio Dairy and Food Commissioner, H. Ankeney (*Ohio Dairy and Food Comr. Rpt. 1903, pp. 72*).—Under the provisions of the State Pure Food Law a number of samples of food were examined, and prosecutions were made in necessary cases. Of 1,947 samples examined 536 were found to be adulterated. The usual statements are also included regarding the funds received, disbursements, etc.

Disinfection and the preservation of food, S. Rideal (*New York: John Wiley & Sons, 1903, 3. ed., pp. X+494*).—It has been the author's purpose to summarize the information which has accumulated on the subject of disinfection with special reference to the needs of the chemist and bacteriologist, as well as medical officers and others who have a practical interest in the subject. Mechanical disinfection, sterilization by heat, chemical disinfectants, personal and internal disinfection, preservation of food, legal statutes and regulations, and methods of analysis are some of the subjects treated of. The present edition, it is stated, has been revised and new material incorporated which has accumulated in the last few years. The author has designed the section on food preservation especially as a manual for those commercially interested in the subject.

"Notwithstanding a general concensus of opinion against the use of preservatives a few years ago," he states, "it would seem impossible under modern conditions of life to do without some methods of keeping perishable articles of food without incurring a very large loss, and it can not be denied that with proper safeguards in some instances even chemical treatment may be desirable."

The influence of food preservatives on digestion, H. W. Wiley (*Dietet. and Hyg. Gaz., 20 (1904), No. 2, pp. 70–72*).—In an address before the Society of Arts, Massachusetts Institute of Technology, the author briefly described the experiments carried on at the Bureau of Chemistry of this Department to study the effect of food preservatives on man.

The use of antiseptics in food in New South Wales (*Public Health [London], 16 (1904), No. 4, p. 243*).—The regulation of the use of food preservatives is one of the duties of the New South Wales board of health. While their use is not forbidden the amount which may be used is limited to not over 0.001 grain per pound, which is regarded for practical purposes as equivalent to prohibition. The law further requires that when preservatives are added the kind and amount shall be legibly stated on the label.

The list of preservatives given in the schedule and the amount permitted follow: Sulphurous acid not more than 1.75 grains, salicylic acid or benzoic acid not more than 1 grain, and boric acid not more than 10 grains per pint of liquid or per pound of solid food. In the following foods none of these antiseptics may be used, save in the proportion of 0.001 grain per pound or pint: Milk, including condensed milk; cream, canned and bottled foods, jams and fruits, aerated waters and temperance drinks, fresh fish, vinegar, sauces, and pickles. The use of sulphurous acid and boric acid is permitted for preserved fish, bacon, and ham.

Concerning the injurious effects of unripe fruit, R. Otto and W. Kinzel (*Landw. Vers. Stat., 59 (1903), No. 3–4, pp. 217–251*).—Detailed chemical analyses of fruits of varying degrees of ripeness are reported, as well as the results of experiments

with guinea pigs, rabbits, and a smaller number with man. The principal conclusions which were drawn follow:

Although unripe fruit is undoubtedly often harmful, particularly with children, the danger from such food, especially green gooseberries, plums, pears, and apples, when eaten raw is less than commonly thought, and the effects depend in marked degree upon individual peculiarities. Cooked green fruit is practically harmless. The injurious effects when eaten raw do not depend upon chemical constituents, but rather upon the unusual proportions in which the constituents occur and the large percentage of hard-cell tissue.

From their investigations as a whole, the authors feel warranted in drawing the conclusion that the sale of green fruit should not be forbidden. When cooked with the addition of sugar, they believe it is both palatable and wholesome. The possibility of injury by bacterial contamination is spoken of and the statement made that this subject will be investigated further.

Mechanics as exemplified by the animal frame, O. FISCHER (*Sci. Amer. Sup., 56 (1903), No. 1459, pp. 23380, 23381*).—The human body is likened to a machine, and the ways in which it agrees with and differs from machines are discussed. The importance of instantaneous photography in determining the character of certain kinds of motion is spoken of, and methods of carrying out experiments by the aid of photography are briefly described.

The physiology of fatigue (*British Med. Jour., 1904, No. 2246, pp. 145, 146*).—A discussion of papers read by Z. Treves and J. Demoor at the recent meeting of the International Congress of Hygiene and Demography at Brussels.

The physiology of bitters (*British Med. Jour., 1903, No. 2235, p. 1166*).—Reasons for the use of bitters and also for the use of soup at the beginning of a meal are discussed.

Concerning the peptic and tryptic digestion of proteids, LAWROW (*Ztschr. Physiol. Chem., 40 (1903), No. 1–2, pp. 165, 166*).—A controversial article.

Proteolytic action of pancreatic juice, W. M. BAYLISS and E. H. STARLING (*Jour. Physiol., 1903, Aug.; abs. in British Med. Jour., 1904, No. 2249, Epit., p. 21*).—The authors confirm the original statement of Bernard that the real pancreatic juice has no action on proteids. Enterokinase, a substance present in the succus entericus, is necessary to render the pancreatic juice active, or in other words to form trypsin from its inactive precursor, trypsinogen. Other experiments, they state, show that trypsinogen can not be converted into trypsin in any way except by the action of enterokinase.

It is concluded that trypsin is not a mixture of enterokinase and trypsinogen, but is a specific substance and the most powerful proteolytic ferment known. It digests itself rapidly, especially if no dissolved proteid is present for it to act upon. The observers further conclude that enterokinase is a true ferment and is produced only in the small intestine.

The digestibility of casein by pepsin-hydrochloric acid and by pancreas ferments, E. FISCHER and E. ABDERHALDEN (*Ztschr. Physiol. Chem., 40 (1903), No. 3–4, pp. 215–219*).—The examination of the cleavage products obtained when casein was slowly digested for a long time with pepsin and hydrochloric acid and with pancreatin led to the conclusion that a-pyrrolidinecarbonic acid and also the ordinary amino acids are to be regarded as constituents of the proteid molecule and, furthermore, that the combined action of pepsin with hydrochloric acid and of pancreatin induces more complete hydrolysis than pancreatin alone.

Contribution to the subject of the destruction of sugar in the animal body by the action of ferments, J. ARNHEIM and A. ROSENBAUM (*Ztschr. Physiol. Chem., 40 (1903), No. 3–4, pp. 220–233*).—Tests of the glycolytic power of the pancreas, liver, and muscle tissues alone and in combination are reported, which led to the conclusion that all of these materials induce cleavage in sugar molecules, this power

varying in degree in the different materials and being markedly increased by the addition of pancreas tissue, but not by the other combinations tested.

Contribution to the subject of the excretion of gastric juice by man, A. F. Hornborg (*Skand. Arch. Physiol., 15 (1904), No. 3–4, pp. 209–258, dgms. 8*).—A boy who had had gastrotomy performed because of an injury and was fed almost entirely through a fistula, furnished an opportunity for the study of the influence of various factors on the secretion of gastric juice. It was found that the sight of food did not cause its excretion. Generally speaking, chewing foods of good flavor caused a more or or less active secretion, and chewing foods of unpleasant flavor apparently influenced the secretion very little, while chewing foods of indifferent flavor was without influence. When substances having a sharp or biting taste were chewed, apparently the secreting glands of the stomach were not stimulated.

In his experiments the author studied the acidity and activity of the gastric juice. The investigations are discussed in relation to Pawlow's theories, and the report contains a bibliography.

The influence of the diet upon the excretion of uric acid, P. Pfeil (*Ztschr. Physiol. Chem., 40 (1903), No. 1–2, pp. 1–24, pls. 7*).—With healthy men as subjects the effect of different foods and combinations of food on the excretion of uric acid was studied. When no meat was eaten the excretion of uric acid was diminished to a small amount. When meat was eaten it was markedly increased. When a diet containing no protein was consumed the uric acid was still excreted and in about the same way as when no meat was eaten. The author studied the time relations of the excretion of uric acid and related topics.

ANIMAL PRODUCTION.

The available energy of timothy hay, H. P. Armsby and J. A. Fries (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 51, pp. 77, pls. 2, dgms. 4*).—Using a respiration calorimeter of the Atwater-Rosa type, which they have constructed with a number of modifications suiting it to experiments with large animals, the authors, in cooperation with the Bureau of Animal Industry of this Department, conducted a series of experiments with a steer with the special object of determining the available energy of timothy hay. Some of the essential features of the respiration calorimeter are very briefly described. The accuracy of the apparatus was shown by check experiments in which alcohol was burned in the respiration chamber. In one of these in which 975.34 gm. of alcohol was burned 99.1 per cent of the theoretical amount of carbon dioxid and 100.8 per cent of the theoretical amount of heat were measured. Equally close results were obtained in the other check tests.

The 4 periods in which the experiment was divided each covered 2 days in the respiration chamber. The ration consisted of timothy hay with a small proportion of linseed meal, the energy being least in the first experimental period and greatest in the fourth. Data regarding the income and outgo of matter and energy, the amount of time the steer spent standing up and lying down, and other experimental details are reported in full.

In the author's opinion, for herbivora the results are not in accord with the commonly accepted theory that as sources of energy the nutrients may replace one another in proportion to their heats of combustion. As pointed out, isodynamic replacement implies that there is no increase in heat production with an increasing amount of food. . . . The results obtained in the periods below the maintenance ration fully confirm this doubt. Only 63 per cent of the metabolizable energy served to prevent loss of tissue, while 37 per cent simply increased the heat production of the animal. In other words, the digested matter of the hay was not isodynamic with body tissue under the conditions of this experiment. Moreover, the

difference is altogether too large to be ascribed to any experimental error or to be accounted for by the discrepancies in some of the results.

"This difference may be reasonably ascribed to the relatively large expenditure of energy necessary in the digestion and assimilation of the hay. Even upon a comparatively light ration, this amount, in addition to the heat arising from the internal work of the body, appears to have been sufficient to maintain the normal body temperature at the comparatively high stable temperature (18.2° C.). Such being the case, when more hay was added the heat arising from its digestion and assimilation was in excess of the needs of the animal for heat and became an excretum, passing off without being of any direct service to the organism.

"In other words, what one of us has elsewhere designated as the critical amount of food must be relatively small in the case of a material like timothy hay, which requires a large amount of digestive work. In our experiment, even the smallest amount of food seems to have been in excess of the critical amount; consequently, when more food was added the additional heat resulting from its digestion and assimilation could not be used indirectly and served simply to increase the heat production, while only the remaining 63 per cent of the metabolizable energy served as fuel for the body in place of the tissue previously consumed."

On the basis of theoretical considerations, which are discussed, the authors believe that for cattle a maintenance ration is "a question of tissue replacement rather than of heat production, and, therefore, that the value of a given feeding stuff for maintenance depends upon the availability of its energy. We may, for instance, regard it as at least very probable that the work of digestion and assimilation in the case of a material like corn meal would be materially less than in the case of hay; or, in other words, that a larger percentage of its energy would be available for the maintenance of tissue. It would follow from this that in case of a ration consisting largely of grain a less amount of material or of metabolizable energy would be required for maintenance than in the case of a ration consisting exclusively of coarse fodder. In other words, the maintenance ration is a variable rather than a constant, depending upon the kind of food used." In the experiments reported the maintenance requirement of the steer, as computed, was 10,710 calories, the average weight of the animal during the experiment being approximately 410 kg.

"Computing to 500 kg. live weight, on the assumption that the maintenance requirement is proportional to the two-thirds power of the live weight, this equals 12,197 calories. . . .

"If the heat production upon the maintenance ration is in excess of the requirements of the animal, it seems unlikely that small variations in the stable temperature to which the animal is exposed will have the effect upon the maintenance requirement which is ordinarily attributed to them. Still less is this likely to be the case with fattening cattle, where the amount of food and the consequent heat production are largely in excess of the maintenance ration.

"Our results indicate that the proportion of the metabolizable energy of the food which was utilized, above the maintenance requirement, to produce gain was decidedly less than that used below the maintenance requirement to prevent loss of tissue. In other words, they indicate that the conversion of digested and assimilated matter into actual tissue (fat) requires a considerable expenditure of energy, amounting in this case to about 47 per cent of the available energy or 30 per cent of the metabolizable energy. This result is quite in accordance with what we should anticipate. The digested matter of the food of herbivora appears to be resorbed chiefly in the form of carbohydrates and of organic acids. It seems altogether probable that a much less profound change is required to convert these resorbed products into forms suited to maintain the energy metabolism of the organism than is needed to convert them into the form of permanent tissue, especially fat. At the same time it should

be noted that the amount of food given in excess of the maintenance requirement in this experiment was small and, moreover, that the results [in 1 lb.] are somewhat doubtful. We do not feel, therefore, that very much stress should be laid upon the apparent results of this experiment in this particular. . . .

"As the figures show, the proportion of the total energy of the hay which was found to be metabolizable diminished as the amount was increased, the difference arising chiefly from differences in digestibility. Since, nevertheless, the total expenditure of energy in digestion and assimilation appears to be approximately proportional to the metabolizable energy, it seems evident that a large share of this expenditure must be for the work of assimilation. Probably a very large factor in it is the loss of energy in the methane fermentation."

Some of the points mentioned in this bulletin have been briefly noted from earlier publications (E. S. R., 14, p. 993; 15, p. 391).

Examination of grain damaged by water, G. E. COLBY (*California Sta. Rpt. 1902–3, pp. 94, 95*).—Notes are given on the food and fertilizing value of wheat and barley damaged by salt water, and of wheat damaged by fire and smoke. Analyses are reported showing the food and fertilizing value of wheat and barley which had been under salt water for 14 months. Samples of wheat damaged by fire and smoke were also examined, and it is concluded that such wheat may be safely fed to poultry and hogs. The grain damaged by salt water is considered of greater value for feeding than for fertilizing purposes.

Concerning milk molasses, G. LOGES (*Landw. Vers. Stat., 58 (1903), No. 5–6, pp. 400–402*).—"Milk molasses," a commercial feed which is described as a mixture of molasses, peanut hulls, and similar materials with casein of skim milk, is considered too expensive to warrant its use. Ordinary beet molasses is regarded as preferable.

Concerning the chemical composition of beet leaves and tops preserved by the Rosam method, O. FALLADA (*Oesterr.-Ungar. Ztschr. Zuckerind. u. Landw., 32 (1903), No. 1; Mitt. Chem. Tech. Vers. Stat. Centralver. Rübenz.-Ind. Oesterr.-Ungar., 1903, No. 148, pp. 21–27; abs. in Centbl. Agr. Chem., 32 (1903), No. 12, pp. 834–836*).—The Rosam process of preserving beet leaves and tops is discussed and analytical data are reported. In this process the beet leaves and tops are thrown into a pile some 15 by 45 ft. and from 8 to 10 ft. deep, care being taken so that on the surface of the pile the leaves are pointed toward the center. The pile is covered with a layer of earth about 2 ft. thick on the top and 1 ft. on the side. This method of preservation is quite similar to ensiling.

Analyses of foods and fodders, G. W. SHAW (*California Sta. Rpt. 1902–3, pp. 84–86*).—Analyses are reported of Ajonjoli meal (also known as bene-seed meal and sesame-seed meal), linseed meal, cotton-seed meal, blood meal, white oak acorns, and native bird's foot clover (*Lotus californicus*). Sesame meal contained 7.4 per cent of water, 36.67 per cent protein, 26.01 per cent fat, 17.34 per cent nitrogen-free extract, 3.81 per cent crude fiber, and 8.77 per cent ash. The native bird's foot clover had the following percentage composition: Water 8.02, protein 12.25, fat 5.97, nitrogen-free extract 47.41, crude fiber 18.80, and ash 8.35.

Licensed commercial feeding stuffs, 1903, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 106, pp. 55*).—In compliance with the provisions of the State law a number of feeding stuffs for which guaranteed composition is required were analyzed, as well as a considerable number of concentrated feeds for which no guaranteed composition is required.

The feeding stuffs analyzed were cotton-seed meal; gluten meals and feeds; hominy feeds; corn or corn and oat feeds; ground corn and oats; wheat bran, middlings, and shorts; miscellaneous dairy feeds; oats; wheat screenings; wheat flour of different grades; buckwheat flour, middlings, shorts, feed, and bran; corn; corn meal; screen-

ing oats; clipped oats; clipped and purified oats; ground oats; mixed grains; barley feed; dried grains (including weed seeds and dried beet pulp); malt sprouts; ground millet and flax screenings; rice bran; poultry feeds (largely of animal origin); and stock foods.

"Fortunately no serious adulterations of concentrated feeding stuffs are practiced in this State, so far as we have been able to ascertain, beyond the admixture of low-grade oat refuse feeds in mixed corn and oat feeds, which . . . is quite common; the admixture of screenings to mill feeds, especially bran, is still practiced by a few mills, but the quality of the mill feed sold in our State is, on the whole, of a high grade."

The care of farm stock (*Bul. Maine Dept. Agr., 2 (1903), No. 4, pp. 105–143*).—Short articles by a number of different authors are included on topics dealing with the feeding and care of farm animals.

Empirical knowledge and experience in the feeding of farm animals, L. Grandeau (*Jour. Agr. Prat., n. ser., 7 (1904), No. 1, pp. 9, 10*).—The fact is pointed out that the feeding of farm animals may be said to rest on a scientific basis. The progress made in recent years is briefly discussed.

Calf-rearing experiments (*Jour. Dept. Agr. and Tech. Instr. Ireland, 3 (1903), No. 4, pp. 627–647, dgms. 4*).—Whole milk; separator skim milk and whole milk 5:1, separator skim milk supplemented by cod liver oil, and separator skim milk supplemented by corn meal were compared with 4 lots of from 7 to 9 calves at Knockbeg, Collooney, Ireland. The test began June 12, 1901. In 20 weeks—that is, when weaned—the gains per head ranged from 176.2 lbs. on skim milk and cod liver oil to 238.6 lbs. on whole milk, the cost of a pound of gain ranging from 3.42 cts. on skim milk and corn meal to 7.98 cts. on whole milk. The feeding was continued until February 16, 1903, when the calves were sold for fattening. Considering the test as a whole, the total gain ranged from 698.5 lbs. with the lot originally fed cod liver oil to 760.6 lbs. with the lot originally fed whole milk.

Beginning June 12, 1901, a second test was made with some of the older calves secured at the same time as those included in the above test. The calves were weaned earlier, the weaning period beginning early in August, and they were sold for fattening February 16, 1903. The rations fed throughout the test were practically the same as in the first test. Considering the entire period, the gains ranged from 678.5 lbs. with the lot originally fed skim milk and corn meal to 759.7 lbs. with the lot originally fed skim milk and cod liver oil. The gains were also most cheaply made by this lot.

It is stated that the experiment furnishes a demonstration of the fact that calves may be successfully reared on skim milk provided a cream substitute is fed with it; that they may be more economically reared on skim milk and a cream substitute than on whole milk; and that the belief generally held locally that creamery milk is the cause of the high death rate among calves is entirely unfounded.

Fattening steers of the various market grades, H. W. Mumford (*Illinois Sta. Bul. 90, pp. 155–217, pls. 13*).—The principal object of this experiment was to determine the relation between the grade of the steers fed and their feeding qualities—that is, whether the quality of an animal determines its capacity for making gains, the ability to use feed economically, and the nature of the gains made. The grades chosen were fancy selected, choice, good, medium, common, and inferior steers, 16 animals constituting a lot in every case.

After a preliminary period all the lots were fed alike for 129 days, beginning November 29, 1902. The grain ration for the early part of the test consisted of chopped corn and cob and later of corn-and-cob meal, with about 8 lbs. of cottonseed meal or linseed meal per bushel of corn in addition. The coarse fodder consisted of clover hay, timothy hay, and later, of alfalfa hay, which through the greater part of the test was chopped and mixed with the grain. A little corn stover was

also fed. During the first month the proportion of coarse fodder to concentrated feed was about 4:3. From this time on the grain ration was gradually increased and the coarse fodder diminished until at last the grain ration was about 5 times as great as the coarse fodder. Considering the test as a whole, the nutritive ratio of the ration was 1:7.64. All the lots were handled alike, being kept in yards with sheds, and throughout the test remained in good health.

At the beginning of the test the steers weighed on an average not far from 1,000 lbs. each. The fancy steers made an average daily gain of 2.57 lbs. per head, at a cost of 6.74 cts. per lb. The average daily gain of the choice steers was 2.543 lbs. and the cost of a pound of gain 8.21 cts. In the case of the good steers these values were 2.341 lbs. and 8.17 cts.; with the medium steers 2.128 lbs. and 8.77 cts.; with the common steers 2.207 lbs. and 8.12 cts.; and with the inferior steers 1.957 lbs. and 8.66 cts. The digestible dry matter required per pound of gain ranged from 9.952 lbs. with lot 1 (fancy steers) to 13.049 lbs. with lot 4 (medium steers). The beef produced per bushel of corn fed ranged from 7.45 lbs. with lot 4 (medium steers) to 9.74 lbs. with lot 1 (fancy steers). The increase in total value of the cattle per 1,000 lbs. of digestible dry matter consumed ranged from $1.91 with lot 4 to $3.11 with lot 1.

The cattle were shipped to Chicago for slaughtering, the shrinkage in shipping ranging from 0.54 per cent with lot 6 (inferior steers) to 2.08 per cent with lot 3 (good steers). When slaughtered the proportion of dressed carcass to live weight ranged from 59.36 per cent with lot 6 (inferior steers) to 61.62 per cent with lot 1 (fancy steers). The greatest range in percentage of caul fat and rough fat was also found with these lots, being for the former 3.39 with lot 1 and 3.83 with lot 6, and for the latter 6.07 with lot 1 and 7.98 with lot 6.

After slaughtering, the steers were judged by experts, and all those in lots 1, 2, and 3 (fancy, choice, and good steers) were rated as No. 1 carcasses, the percentage of prime animals being the largest in lot 1, in which case 15 were designated as prime and 1 as choice. In the case of lot 4 (medium steers), "1 finished as choice, 4 as good, 8 as medium, and 3 as common. Four of the carcasses in this lot graded as No. 1 light, and the remainder as No. 2 tops." With lot 5 (common steers), "5 finished the test as good, 6 as medium, and 5 as common beeves. The grading of the beef was the same as that in lot 4, namely, 4 carcasses graded as No. 1 light, and 12 as No. 2 tops." Considering lot 6 (inferior steers), "4 finished as good, 6 as medium, and 6 as common. Six carcasses graded as No. 1 light, 9 as No. 2 tops, and 1 as No. 3 beef."

This and other data, in the author's opinion, shows the possibility of securing reasonably high percentages of dressed beef of satisfactory grade, even with low-bred steers, provided they are intelligently fed to as high a finish as they are capable of taking. The financial aspect of the test is discussed in detail on the basis of a steady, or what would ordinarily be considered a normal, market and a falling or declining market.

The author's principal conclusions are in effect as follows: More rapid and much larger gains may be secured with the better grades than with the more common grades. When the various grades of beef cattle are put in the best marketable condition there is a very definite relation between the percentages of dressed beef and the grade of cattle involved. The better the grade of cattle the higher the percentage of dressed beef. Low-grade cattle carry larger percentages of internal fat than those which are better bred, while there appears to be a more abundant and more evenly distributed layer of surface fat on the better-bred steers.

Since differences between animals tend to disappear as the feeding process goes on, the differences in quality between various grades are more pronounced than such differences between the various grades of beef or fat cattle. Quality is the more important consideration in feeding cattle; condition, in fat cattle.

The grade of cattle the finishing of which will return to the cattle feeder the greatest profit will depend upon the following considerations: The relative ability of the various grades to use feed for the production of gain and finish, the relative cost of the various grades of feeding cattle, the cost of feed, the method of feeding and time of marketing, and the range in prices between prime and common rough steers or between the highest and lowest grades of beef cattle.

The greater the cost of the feed used the greater is declared to be the advantage in favor of the better grades, both because under normal market condition the gains and finish of these grades are put on with less relative feed consumption than in the lower ones (although this difference is less marked in the inferior than in the intermediate grades), and because the cost of feed is a larger factor in the feeding of the lower than the higher grades.

"The greater the spread in the market between the various grades of feeders, the more is the advantage in favor of the commoner grades. As a rule the price of common rough steers fluctuates less than the price for prime steers, and the price of the inferior and common grades of feeders varies less than those of the choice and fancy grades. . . . The greater the spread in the market between the various grades of fat steers the more is the advantage in favor of the better grades. . . . When prices rule low in the beef-cattle class and the market is dull and has a downward tendency, the range of prices between prime steers and common rough steers is narrow, and, as a result, condition or fat is more important than quality or beef blood. As a rule, prices of common rough steers in the beef-cattle class fluctuate less than the prices for prime steers. Hence it will be seen that in general there is less liability to large losses from market fluctuations in the feeding of the commoner than the better grades of feeding cattle. On the other hand, the chances for making large profits are undoubtedly greatest with the better grades. . . . By reducing the corn fed to meal and mixing same with roughage the importance of pork production as a factor in cattle feeding is minimized. Notwithstanding this, the pig, even under such conditions, should not be eliminated. Properly managed he may return a credit to each steer fed of approximately $2."

The gains of pigs following each lot of steers in the above experiment are given. These ranged from 419 lbs. in the case of the animals following lot 1 (fancy steers) to 520 lbs. in the case of those following lot 4 (medium steers).

Wheat v. maize as food for fattening cattle, T. WINTER (*Bd. Agr. and Fisheries* [*London*], *Rpt. Agr. Education and Research, 1902–3, pp. 66–68*).—One lot of 5 steers was fed 3 lbs. of maize meal per head daily, and another similar lot 3 lbs. of wheat meal, both lots receiving a uniform basal ration of pulped swedes, chaffed oat straw, chaffed hay, and decorticated cotton-seed cake. In 10 weeks the lot fed maize meal gained 791 lbs. and the lot fed wheat meal 749 lbs. The maize meal ration was somewhat the cheaper.

On the basis of the results obtained the author points out the fact that wheat is a valuable feeding stuff and that "it may frequently be more profitable to consume it at home than exchange it on the market for maize, when such a transaction entails considerable expense."

Feeding experiments, E. R. LLOYD (*Mississippi Sta. Rpt. 1903, pp. 12, 13*).—Statistics are given regarding the pigs kept at the station, and the wintering of the station sheep and breeding cattle. In addition, several feeding experiments are very briefly reported.

In a comparison of open yards and shelter, made with 2 lots each containing 5 steers fed the same ration of cotton-seed hulls and meal, the lot fed under shelter gained 623 lbs. in 90 days and the lot fed in the open yard 731 lbs. At the beginning of the trial the difference in weight between the 2 lots was 110 lbs.

Using 2 lots, each containing 4 2-year-old steers, differing in weight by 63 lbs.,

Johnson grass hay was compared with cotton-seed hulls. Lot 1 ate 4,550 lbs. of Johnson grass hay and 1,790 lbs. of cotton-seed meal and gained in the 90 days of the test 342 lbs. On the same quantity of cotton-seed meal and 5,238 lbs. of cotton-seed hulls lot 2 gained 370 lbs.

In a second test a lot of 2-year-old heifers was fed Johnson grass hay without grain and consumed little more than enough to maintain them; while a second lot, fed cotton-seed hulls without grain, would not eat enough for maintenance, losing 83 lbs. in 39 days when 20 lbs. of hulls were consumed per day per 1,000 lbs. live weight.

Four animals pastured on poor Bermuda grass and fed grain twice daily consumed during the summer $24.36 worth of grain and gained 760 lbs; while a second lot of 4 animals, pastured without grain, gained 500 lbs. during the summer. A lot of thin but vigorous 2-year-old steers after being wintered on a ration little more than sufficient for maintenance made an average daily gain of 1.3 lbs. on pasturage for 178 days. A similar lot which had received full feed during the winter made an average daily gain of 0.75 lb. for 158 days on pasture. Heifers of the same age wintered on lignt feed made an average daily gain per head of 1.3 lbs. for 178 days on pasture alone. The pasture contained 20 acres of open land seeded to orchard grass, redtop, alfalfa, melilotus, oats, and hairy vetch. Excluding woodland, the pasture "carried 1 cow to every 1.1 acres for 7 months."

Sheep feeding, W. T. Lawrence (*County Councils Cumberland, Durham, and Northumberland Rpt. 1902, pp. 126, 127*).—At Newton Rigg the advantage of allowing sheep to gather Swedish turnips, as compared with feeding the turnips to pastured animals, was studied with 2 lots, each containing 20 crossbred sheep. In 11 weeks the average gain per head per week with the lot fed the turnips on pasturage was 1.8 lbs. as compared with 2.3 lbs. in the case of the sheep penned on the turnip land. Somewhat smaller profits were obtained with the lot fed turnips on pasture than with the other lot.

According to the author the results fully corroborate those of former years (E. S. R., 13, p. 482), which have shown that in wet or dry weather sheep fatten more rapidly on turnip land than on grass, other conditions being equal.

Sheep-feeding experiment at Newton Rigg, D. A. Gilchrist (*Bd. Agr. and Fisheries [London], Rpt. Agr. Education and Research, 1902–3, pp. 93, 94*).—Noted above from another publication.

Experiments in sheep breeding, T. Winter (*Bd. Agr. and Fisheries [London], Rpt. Agr. Education and Research, 1902–3, pp. 70–76*).—The breeding experiments begun several years ago (E. S. R., 14, p. 996) were continued. As regards the results obtained in crossing Wiltshire, Kerry Hill, Shropshire, and Southdown rams with Welch mountain ewes, the best results were with the Southdown, and in the author's opinion this breed furnishes a particularly suitable cross for Welsh mountain ewes for the production of fat lambs.

In a test of the value of various crosses with large crossbred ewes for the production of fat lambs, while there was not much difference between the Border-Leicester and Suffolk crosses the advantage was rather with the latter. The Border-Leicester crosses were somewhat earlier than the others. The Wiltshire cross was less satisfactory than the preceding year. "The Hampshire cross were later, but they handled well and reached good weight. The Lincoln cross proved disappointing. The lambs were neither so ripe nor so heavy as those in some of the other lots."

The native sheep of the Kerry Hill district of Montgomeryshire were crossed with Border-Leicester, Wiltshire, and Suffolk rams to determine the suitability of these crosses for the production of lambs for market purposes. The Suffolk cross was the most successful. "The lambs fattened earlier, on the whole were heavier, and were equal to any in quality. On this year's trial the Border-Leicester cross was superior to the Wiltshire cross."

Dried grains v. crushed oats as food for fattening sheep, T. Winter (*Bd. Agr. and Fisheries [London], Rpt. Agr. Education and Research, 1902–3, pp. 68–70*).—In a test covering 10 weeks the relative merits of dried brewers' grains and crushed oats were studied with 2 lots, each containing 33 Border-Leicester-Cheviot sheep. The grains tested were fed with decorticated cotton-seed cake and in addition Swedish turnips and hay ad libitum. On the ration containing dried brewers' grains the average gain in weight was 15.12 lbs. per sheep and on the crushed oat ration 16.86 lbs. The author calculates that there was a net profit of $3.26 in favor of the sheep fed the oat ration.

Annual wool review, W. J. Battison (*Boston: Rockwell and Churchill Press, 1903, pp. 47; repr. from Bul. Nat. Assoc. Wool Manufacturers, 1903, Dec.*).—This publication contains estimates of the number of sheep and of the wool products of the United States for 1903, discussions of forest reserves and sheep raising, weight of fleece and shrinkage of wool, and a number of tables furnishing statistical data of interest to those engaged in wool production and the wool trade.

The estimated value of the wool crop of 1903, "based on the value of the scoured pound at the seaboard," is 124,366,205 lbs., having a total value of $58,775,373, the value per pound for fleece being 48.8 cts. and for pulled wool 43.4 cts. The total value of the wool crop is 3.14 per cent less than that of the previous year, the decrease being due to a reduction in the total quantity of wool produced. On the other hand, the value of fleece wool, it is stated, has increased 7.86 per cent and that of pulled wool 9.32 per cent. In 1903 the average weight of fleeces was 6.25 lbs. as compared with 6.50 lbs. in 1902, and the average skrinkage 60.8 per cent as compared with 60 per cent.

Regarding the sheep industry in the United States the conditions indicate "that the future prosperity of the American sheep industry lies in a gradual but radical change in the manner in which it is conducted. The day of extremely large flocks on unlimited ranges is beginning to pass away. The sheep will have to be kept in smaller flocks, and those adapted to closer confinement substituted for breeds which are dependent on a wide range for profitable existence. . . . Surprise has often been expressed that farmers in the Eastern and Middle States do not pay more attention to sheep. The cause appears to be, in a great measure, the same as that which prevents the growing of carpet wools in this country. Other branches of agriculture require less care and exertion, or yield better returns for capital invested and time and labor expended. . . . Notwithstanding the disadvantages, there is still a good profit to be made from sheep, and we note a tendency in New York State toward an increase in the number of small flocks, on farms in heretofore exclusive dairy sections, the sheep being kept partially for the purpose of destroying weeds in the pasture."

Feeding dried potatoes, W. Schneidewind (*Illus. Landw. Ztg., 23 (1903), No. 48, p. 523; abs. in Centbl. Agr. Chem., 32 (1903), No. 12, pp. 830, 831*).—Feeding experiments with pigs convinced the author that dried potatoes, even if finely ground, were less digestible than ground barley; so different methods of preparation were tested with a view to increasing their digestibility, including very fine grinding, soaking in hot and cold water, and treatment with malt. The last method was the only one which gave satisfactory results. Malting was easily accomplished, malt being simply added to potatoes wet with hot water and allowed to stand for several hours. The mass was thick at first but soon became rather thin and was readily eaten in this form. Cattle and horses, it is stated, digest dried potatoes more thoroughly than pigs.

Bacon production, G. E. Day (*Ontario Agr. Col. and Expt. Farm Bul. [illegible], pp. 23, figs. 2, dgms. 5*).—Various problems connected with bacon production are discussed on the basis of results obtained at the station, such topics as the following being con-

sidered: Buildings, Canadian export bacon trade, breeding for bacon, feeding, and management.

Feeding of poultry, C. E. J. Walkey (*Jour. Bd. Agr. [London], 10 (1903), No. 3, pp. 355–369, figs. 2*).—The feeding and care of chickens, ducks, geese, and turkeys are discussed; rations are suggested; directions for making poultry houses are given, and other related topics are spoken of.

Poultry fattening by trough and machine (*Mark Lane Express, 88 (1903), No. 3748, p. 70*).—Four tests, each with 44 chickens and covering about 3 weeks, were made at the Agricultural and Horticultural Training Farm at Uckfield. The chickens were fed from troughs and later with a cramming machine, receiving a mixture of skim milk, ground oats, and fat in different proportions. The best results were obtained when 8 lbs. of ground oats and 1 lb. of fat were fed per gallon of skim milk.

Fattening fowls in Ireland (*Mark Lane Express, 88 (1903), No. 3724, p. 171*).—In a test made by the Windgap Cooperative Poultry Society, County Kilkenny, 28 fowls, divided into lots of 7, and fed in coops for 10 days on maize meal and pollard 4:3, wet with separator skim milk, gained nearly 1 lb. each. The total profit was calculated to be $3.54.

Breeding geese for "foie gras" (*Mark Lane Express, 88 (1903), No. 3762, p. 482*).—The fattening of geese for the production of large livers for use in making "foie gras" is briefly described. During the fattening period, which lasts from 4 to 5 or possibly 6 weeks, the birds are kept in close cages and are fed 2 or 3 times a day, by cramming, a daily ration consisting of 1.5 lbs. maize meal and beans cooked in water, the amount being increased as the appetite grows. The geese are supplied with fresh water to which a little wood charcoal is sometimes added.

The effect on hens' eggs of the rays emitted by radium, G. Schwarz (*Arch. Physiol. [Pflüger], 100 (1903), No. 9–10, pp. 532–546, figs. 5*).—Two-hundredths gram of radium bromid inclosed in a brass box was placed on the shell of an egg. In the bottom of the box there was an opening covered by a plate of mica which permitted the passage of the Becquerel rays. In one of the tests the operation was carried out in an atmosphere of hydrogen.

From the results of all the tests it appeared that the rays induced a number of marked changes. Where they acted upon the shell a light-gray color was noticeable. The membrane lining the egg was unaffected, but the white was thickened and a sort of skin formed in it. A luminous light-gray patch about 5 mm. in diameter was observed in the yolk. This patch was somewhat harder than the surrounding portion. The flavor was changed.

The author concludes that the Becquerel rays induce changes in albumenoid bodies similar to those produced by dry distillation, but do not cause extensive changes in native proteids. They remove the color from the organic pigment lutein. Furthermore, these rays exercise a marked effect upon lecithin in cell substances. This fact, it is believed, explains their biological effect, and especially their effect upon rapidly growing normal and pathological tissue.

Pheasants, C. L. Darlington (*Boston: Hub Poultry and Supply Co., 1902, pp. 48, pls. 4, fig. 1*).—On the basis of personal experience, the author gives directions for housing, breeding, feeding, care, and management of Asiatic pheasants, quail, prairie chickens, and partridges or ruffed grouse. In the author's opinion all these birds may be successfully and profitably raised in captivity.

DAIRY FARMING—DAIRYING.

Report of dairy department, J. S. MOORE (*Mississippi Sta. Rpt. 1903, pp. 14–19*).—A record is given of 9 cows for one year. The average yield was 5,329 lbs. of milk and 295.2 lbs. of butter fat. The cost of feed was $30.34, and the value of butter, at 25 cts. per lb., $86.11. A comparison was made of Johnson grass hay and cotton-seed hulls. The experiment included 2 lots of 3 cows each and lasted about 12 weeks. The results indicated that 15 lbs. of well cleaned cotton-seed hulls is equal in feeding value to 10 lbs. of prime Johnson grass hay. Data are given for an experiment in feeding 3 calves on skim milk.

Creaming by the centrifugal separator and by the shallow pan system were compared as regards the loss of fat in the skim milk. The average results of a number of tests showed 0.078 per cent of fat in the skim milk from the centrifugal separator, and 0.33 per cent from the shallow-pan system, the temperature in the latter case ranging from 61 to 69° F. It is stated that the results indicated a much smaller percentage of fat in the skim milk from the shallow-pan system than is usually claimed.

The dairy industry in Denmark, H. DE ROTHSCHILD (*L'industrie laitière au Danemark. Paris: Octave Doin, 1904, pp. 106, pls. 33, figs. 5, map 1*).—This report is addressed to the Minister of Agriculture of France, under whose direction a study was made of the feeding of cows, the production and sale of milk, and the manufacture of butter in Denmark, and is a clear, well illustrated exposition of the subject.

In part 1 of the report, dealing with the production of milk, the author describes the breeds of dairy cows and considers stable hygiene, feeding, milking, instruction in dairying, cooperative societies for the improvement of dairy herds by feeding and breeding, and feeding experiments. In part 2, on commerce in milk, descriptions are given of the 2 principal dairies supplying the city of Copenhagen with milk. In part 3, dealing with the manufacture and exportation of butter, descriptions are given of a cooperative dairy and a cooperative butter factory; and dairy societies, control of margarine and butter, butter exhibits, and exportation of butter are discussed.

Butter-fat tests of thoroughbred cows, L. ANDERSON (*California Sta. Rpt. 1902–3, p. 119*).—Data are given for official 7-day tests of 3 Holstein cows.

The Hegelund or Danish method of milking compared with the ordinary method, HENKEL (*Milch Ztg., 33 (1904), Nos. 1, pp. 4–6; 2, pp. 19, 20*).—The Hegelund method of milking is described and several tests of the method are reported.

One test lasting about 1 week was made in Bavaria with 37 cows. The cows were first milked in the ordinary manner, except that unusual care was taken to secure all the milk possible. They were then milked by the Hegelund method. The average daily yield by the ordinary method was 7.16 kg. of milk, containing 3.85 per cent or 275.8 gm. of fat. The residual, or after-milk obtained by the manipulation method averaged 217.4 gm. per day and contained 7.8 per cent or 17 gm. of fat. The increase yield obtained by the Hegelund method was therefore 3.4 per cent of milk and 6.2 per cent of fat. In no case was it impossible to obtain additional milk by the Hegelund method.

Similar tests with 6 cows were made in two localities in Algau. The average additional yield by the Hegelund method was 272.1 gm. of milk and 20.9 gm. of fat, or 2.5 and 5.3 per cent, respectively.

In each of 3 other experiments 3 cows were milked in the ordinary manner for several days, then by the Hegelund method for a similar period, and finally by the ordinary method during a third period. Weather conditions interfered somewhat with one of the tests, nevertheless the results as a whole were considered as favorable to the Hegelund method.

The additional time required by the Hegelund method following ordinary milking averaged from 2 to 2½ minutes. The increased yield is thought to pay well for the

extra time, although other advantages such as increasing the productive capacity of cows, lessening the occurrence of diseases of the udder, and necessitating increased cleanliness are claimed for the method. On the basis of the results obtained it is estimated that the general adoption of the method would increase the annual value of the milk production of Germany to the extent of $30,000,000.

Results of demonstration experiments on the feeding of dairy cows, conducted under the supervision of the Government during the winters of 1901-2 and 1902-3, J. VANDERVAEREN (*Bul. Cercle Études Agron.* [*Brussels*], *1904, No. 9, pp. 505–519*).—During the winters of 1901–2 and 1902–3, 92 feeding experiments were conducted in the different provinces of Belgium under the supervision of representatives of the ministry of agriculture. The details of these experiments have appeared in two reports (E. S. R., 14, p. 488; 15, p. 809). This article summarizes some of the results. It was found that the rations in ordinary use were frequently more expensive than necessary, and were often deficient in proteids. Under the direction of an expert the ration in ordinary use was compared with a new ration made up of the same materials with the addition, in most instances, of feeding stuffs rich in proteids furnished gratuitously by the Government. Each experiment comprised two periods during which the ordinary ration was fed and an intervening period during which the improved ration was fed, the three periods being separated by transitional periods. The results of the experiments are presented in two tables. In 37 out of the 39 experiments conducted with 129 cows during the first winter the results showed a net profit varying from about 1.7 to 2.1 cts. per day per cow, not including the increased value of the manure. In 52 out of the 53 experiments conducted with 156 cows during the second winter the increase in net profits varied from about 0.9 to 28 cts. per cow per day. Averaging all results the net profit the first winter was increased about 6.4 cts. per cow per day, and the second winter about 6.3 cts. From these results it is estimated that the average increase in net profit per year from rational feeding would amount to about $9.65 per cow.

Demonstration experiments on the feeding of dairy cows, conducted at the expense and under the supervision of the Government during the winter of 1902-3 (*Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 6, pp. 991–1193*).—This is a detailed report upon 53 feeding experiments carried out in the different provinces of Belgium with a view to improving the rations in ordinary use. The number of cows in the different experiments was usually 2 to 4. The experiments lasted generally about one month, and in each instance consisted in a comparison of the ordinary ration and a modification of this ration believed to be better adapted to the conditions. The results are discussed and summarized for the individual experiments, but no general conclusions are drawn.

Concentrated commercial feeding stuffs and the feeding of dairy cows, A. GRÉGOIRE (*Bul. Cercle Études Agron.* [*Brussels*], *1904, No. 9, pp. 495–504*).—The author discusses the composition of feeding stuffs, the rôle of the different nutrients in animal nutrition, and the calculation of rations, and describes some of the more frequently used concentrated feeds such as linseed cake, cotton-seed meal, malt sprouts, etc. Some of the results of the demonstration experiments conducted in Belgium are given in the discussion. In 39 out of 51 instances the amount of digestible proteids actually fed was below the amount estimated as required.

Relations between food fat, body fat, and milk fat, A. EINECKE (*Mitt. Landw. Inst. Univ. Breslau, 2* (*1903*), *No. 3, pp. 559–645, dgm. 1*).—This article consists of a critical review of the literature of this subject and the details and summarized results of 4 feeding experiments.

Goats were used as the experimental animals, the number varying in the different experiments from 2 to 4. Each experiment consisted of 3 periods of 14 days each, not including a preliminary period. During the second period an emulsion of either rape-seed oil, cocoanut oil, or linseed oil was fed, the results being compared with

those obtained during the first and third periods, when only the control ration, consisting for the most part of hay and wheat feed, was fed The nutritive ratio of the rations was approximately 1:5.4. The fat content of the milk was determined gravimetrically and by the Gerber method, and determinations were made of the Köttstorfer, Reichert-Meissl, and Hübl numbers, the index of refraction, and the melting point of the butter fat. Slaughter tests were also made in some of the experiments.

No constant relation was observed between the feeding of 30 or 50 gm. of rape-seed oil per head per day and the yield of milk. Neither was there apparently any specific influence exerted by the fat in the food upon the percentage of fat in the milk. The yield of fat on the whole was slightly increased by the feeding of rape-seed oil and linseed oil. Cocoanut oil fed at the rate of 30 gm. per head per day increased the yield of fat, and fed at the rate of 50 gm. decreased the yield. In no case, however, was the increase in yield sufficient to justify, from a practical standpoint, the intensive feeding of fat.

In 3 of the experiments the results showed a specific influence of the fat in the food upon the chemical composition of the butter fat, while in the fourth experiment no such influence was apparent. Rape-seed oil and linseed oil decreased the Köttstorfer and Reichert-Meissl numbers and increased the Hübl and refractometer numbers. Cocoanut oil in one experiment increased the Köttstorfer number and decreased the Reichert-Meissl, Hübl, and refractometer numbers, while in another experiment it was apparently without influence in this respect. The melting point of the butter fat was lowered to a slight extent by rape-seed oil and cocoanut oil, and to a greater extent by linseed oil. The influence of feeding fat upon the chemical composition of butter is considered as clearly established by the experiments of the author and by the experiments cited in the article.

Determinations were made of the Köttstorfer, Reichert-Meissl, and Hübl numbers of the body fat of goats killed at the end of the different periods. While the Hübl number of butter fat was increased by the feeding of fat, that of the body fat was decreased. The results are discussed in relation to the hypothesis of Soxhlet, that in the intensive feeding of fat the organism utilizes primarily the body fat rather than the food fat in the production of butter fat, which hypothesis, as well as that relating to the profitableness of such feeding, were not considered as confirmed by the work reported.

The source of milk fat, its changes, and experiments in the determination of individuality in milk secretion, I. Dolgikh (*Arch. Vet. Nauk, St. Petersburg, 33* (*1903*), *Nos. 11, pp. 1118–1159; 12, pp. 1243–1325*).—The literature of this subject is critically reviewed in connection with bibliographical references, and an attempt is made to draw from this mass of literature conclusions regarding the source of milk fat and the individuality of milk secretion in different cows.

It was found in a study of the literature that the time of the maximum production of milk varied in different cows according to individual peculiarities, which could not be definitely formulated. In general the quantity of milk produced was greater when the cows were fed on a heavy ration than when fed on medium or light rations. A considerable difference, however, was observed in the ability of different cows to make profitable use of large quantities of fat. The ability of yielding large quantities of milk and producing correspondingly large quantities of milk fat appears to be capable of increase, but depends also to a considerable extent upon the potential nervous energy of individual cows and upon the physical development of the various organs of the body.

Influence of feeding and milking on the composition of milk, P. Dechambre (*Jour. Agricole* [*Paris*], *14* (*1903*), *Nos. 164, pp. 191–194; 165, pp. 216–219*).—The author discusses briefly the rôle of proteids, fats, and carbohydrates in the nutrition of cows, the influence of various feeding stuffs upon the composition of milk, and

the effect of different methods of milking. Sanitary precautions to be observed in milking are mentioned.

On the variation in the composition of cow's milk, W. A. D. RUDGE (*Dept. Agr. Cambridge Univ. Rpt. 1902–3, pp. 92–98, dgms. 3; Bd. Agr. and Fisheries* [*London*], *Rpt. Agr. Education and Research, 1902–3, pp. 120–125*).—Three cows were milked at equal intervals, twice daily for 14 days, and at intervals of 16 and 8 hours for another period of 14 days. Determinations were made of the total solids and fat in the milk of each cow morning and evening. The data showed considerable variations in the yield and fat content of the milk, especially when the intervals between milkings were unequal; a larger yield of milk with a lower fat content following the longer interval. The cow giving the richest milk showed also the greatest variations in the yield and fat content of the milk.

Daily variations in the acidity and fat content of milk, M. SIEGFELD (*Molk. Ztg.*, *17* (*1903*), *No. 49, pp. 1075, 1076*).—The morning's milk of 5 dairies was tested daily for about 6 weeks. The acidity in terms of cubic centimeters of decinormal sodium hydroxid required to neutralize 100 cc. of milk varied from 13.2 to 19.5. Differences of 1 or 2 cc. from morning to morning were common. The greatest difference was 4.9. The daily variations in amount of fat in the milk of the 5 herds exceeded 0.5 per cent from 1 to 9 times during the 36 days on which tests were made. The greatest daily variation was 1.05 per cent. Causes of such variations are noted and earlier work by the author is cited (E. S. R., 12, p. 786; 13, p. 885).

The influence and the disposition of some mineral substances fed to milch cows, C. SCHULTE-BÄUMINGHAUS (*Mitt. Landw. Inst. Univ. Breslau*, *2* (*1902*), *No. 1, pp. 25–69; abs. in Centbl. Agr. Chem.*, *32* (*1903*), *No. 7, pp. 477–483*).—A study was made of the effect of feeding calcium hydroxid, sodium chlorid, iron acetate, and calcium phosphate. None of these substances affected apparently the yield of milk or its fat content; neither was the total ash appreciably affected. Calcium hydroxid and calcium phosphate increased slightly the percentage of calcium in the ash. There was no increase in the phosphoric acid or iron due to the feeding of these substances.

A contribution to the study of slowly creaming milks, L. MARCAS (*Bul. Agr.* [*Brussels*], *19* (*1903*), *No. 6, pp. 1228–1234*).—In continuation of the work of Henseval (E. S. R., 14, p. 388), the author made a comparative study of ordinary milk and milk showing a slow rising of the cream. In creamometer tests with ordinary milk at 10 to 14° C. the layer of cream was clearly differentiated in 6 to 8 hours, while with samples of slowly creaming milk the separation was not complete in 12 hours and occasionally no differentiation was apparent at the end of 24 hours. A similar difference between the 2 types of milk was shown in experiments with the centrifuge. The fat content of the slowly creaming milk was generally higher than that of ordinary milk. The averages of a number of analyses of the 2 types showed respectively 3.95 and 3.08 per cent of fat. The other constituents in the slowly creaming milk were also normal. The results of a number of experiments with different centrifugal separators showed that the skim milk from the 2 types of milk varied in fat content from 0.1 to 0.15 per cent. A still greater difference was observed in the skim milk obtained in the creamometer tests. Determinations were made of the phosphoric acid and lime in the ash of the slowly creaming milk, and instead of finding a deficiency, as reported by other investigators and advanced as a cause of the peculiarity, the author found a slight excess of these constituents.

Premature coagulation of milk, R. BURRI (*Milch. Ztg.*, *32* (*1903*), *No. 45, pp. 705–707*).—The milk of a number of cows was found to coagulate in 5 hours when kept at 37° C., while ordinarily coagulation under such conditions would not occur until a much later period. A bacteriological examination of this milk when fresh showed the almost exclusive presence of 2 forms of bacteria, one a liquefying micrococcus and the other lactic-acid bacteria, which latter comprised 5 per cent or more of the total number of bacteria present.

The micrococcus developed to the exclusion of the lactic-acid bacteria, and was practically the only form found at the time of coagulation. This organism is believed to be an inhabitant of the udder, especially of the milk ducts, and its growth there is thought to be facilitated by incomplete milking. Its action in coagulating milk, which was also demonstrated experimentally, is attributed to the production of a rennet ferment. The coagulated milk was sweet to the taste and showed no higher percentage of acid than normal milk.

Chemical composition of the milk supply of Milan, C. BERTOCCHI (*Ann. Soc. Chim., 1903, No. 4–5; abs. in Rev. Gén. Lait, 3 (1904), No. 7, p. 163*).—Analyses were made of 4,700 samples of milk from 2,100 cows in one locality, and of 18,610 samples from 2,300 cows in another locality, the average composition in the first case being specific gravity 1.0317, fat content 3.61 per cent, solids-not-fat 8.91 per cent; and in the second case specific gravity 1.0316, fat content 3.70 per cent, and solids-not-fat 8.91 per cent. The author concludes that the local regulation requiring 9 per cent of solids-not-fat should be modified.

The bacterial content of fresh milk, A. LUX (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), Nos. 6–7, 195–201; 8–9, pp. 267–277*).—The 6 species of bacteria most frequently found in the 260 samples of cows' milk and 95 samples of goats' milk examined were *Staphylococcus mastitis albus*, *S. mastitis aureus*, *Galactococcus versicolor*, *Bacterium prodigiosum*, *B. luteum*, and a non-liquefying, gas-producing bacterium (*B. lactis ærogenes*, *B. acidi lactici*, or *B. coli commune*). The different organisms are described. Of these the *Staphylococcus mastitis albus* was by far the most frequently found.

The results of the experiments are given in a series of tables which show among other data the number and kind of bacteria in the first, second, and third streams of milk, a sample obtained at the middle of the milking, and a sample obtained at the end of the milking; and also the number of bacteria in the milk from the different teats. Considerable variations were observed in the number of bacteria in the different samples. In general, however, the first milk was no richer in bacterial content than the second or third streams, and often contained less than the samples obtained at the middle and end of the milking.

The daily variations in number of bacteria per cubic centimeter in milk drawn from the same teat were marked. The figures for 6 consecutive days were as follows: 2,044, 1,844, 600, 1,467, 11, and 44. The influence of the length of time between milkings upon the bacterial content of the milk was also studied. Samples of milk obtained after intervals varying from 2 to 24 hours showed a bacterial content in one instance ranging from 22 to 1,217, and in another instance from 65 to 2,933 per cubic centimeter, the numbers increasing with the length of time. Some influence on the bacterial content of the milk was attributed to the feeding stuffs, which were not uniform for the different groups of animals.

Powdered milk, A. DUBOIS (*Jour. Agr. Prat., n. ser., 7 (1904), No. 1, pp. 15, 16, fig. 1*).—The Just-Hatmaker method of making milk powder is described.

Dried milk, J. VANDERVAEREN (*Rev. Gén. Agron. [Louvain], 12 (1903), No. 11, pp. 471–477*).—A summary of information regarding preparations made from skim milk dried and ground.

A new aroma-producing species of bacteria in butter, S. A. SEWERIN (*Centbl. Bakt. u. Par., 2. Abt., 11, 1903, Nos. 6–7, pp. 202–206; 8–9, pp. 260–266*).—The cultural characteristics of a bacterium isolated from sour cream, having a pleasant, fruity odor, are described. The organism, to which the name *Bacterium aromaticus butyri* is given, was capable of producing the characteristic aroma in different culture media at room temperatures. In milk the aroma was produced to a marked extent only when the organism was grown in symbiosis with lactic-acid bacteria. The development of the organism in butter rather than in the cream from which it was made

resulted in the appearance of the aroma in the course of 2 to 4 weeks. When grown on ordinary gelatin the development of aroma ceased in 3 months; but when grown on other media, including lactose-gelatin, the development of the aroma was constant during the 8 months in which observations were made.

Weedy flavors in butter, L. ANDERSON (*California Sta. Rpt. 1902–3, pp. 121–126*).—Several experiments were made at a creamery for the purpose of finding a method of getting rid of flavors in butter which seemed traceable to weeds eaten by cows. Full data, including analyses of the butter, are given for the 7 experiments made. Butter made according to the regular practice of the creamery and with no starter, or with a buttermilk or Hansen's pure culture starter, had in all cases the objectionable flavor attributed to the weeds. Butter made from cream which had been mixed with an equal volume of warm water and again run through the separator was commented upon as having no flavor whatever. Butter made from pasteurized cream was also free from the weedy flavor.

Ripening of cheese in cold storage compared with ripening in the ordinary curing room, H. H. DEAN and R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Bul. 131, pp. 16, dgms. 2*).—This gives the results of 8 series of experiments conducted during 1902 in continuation of earlier work (E. S. R., 14, p. 909).

In the first series 4 cheeses were made from the same vat of milk. One cheese was ripened in cold storage at about 38° F., one was placed in an ordinary curing room for 1 week and then in cold storage, one was placed in an ordinary curing room for 2 weeks and then in cold storage, and one was ripened in the ordinary manner. The experiment was repeated 6 times during the period from April to September. The loss in weight of the 4 cheeses during 1 month averaged, respectively, 2.26, 2.90, 3.20, and 4.21 per cent. Very little difference was observed in the quality of the cheese ripened in cold storage, while that ripened in the ordinary curing room was much inferior in quality.

In the second series 4 cheeses were ripened in cold storage and one was ripened in the ordinary curing room. One cheese was removed from cold storage at the end of 1 month, one at the end of 2 months, and one at the end of 3 months. Six experiments of this kind were made during the season. The cheese ripened entirely in cold storage stood first as regards quality. The cheese ripened in the ordinary curing room was the poorest. While the quality was improved by the length of time in cold storage, no marked deterioration was observed in the cheese removed from cold storage to a higher temperature.

In the third series the effect of an extra quantity of rennet was studied. In each of 8 experiments 4 cheeses were made, rennet in all cases being used at the rate of 6 oz. per 1,000 lbs. of milk. One cheese was placed in cold storage directly from the press, one at the end of 1 week, one at the end of 2 weeks, and one was ripened in the ordinary curing room. The average total scores were respectively as follows: 94.45, 93.89, 92.75, and 89.10. As compared with the results obtained in other series of experiments, the extra quantity of rennet was believed to improve the quality of the cheese. The results were also believed to indicate that where a large quantity of rennet is used the cheese should be placed in cold storage soon after being made.

In the fourth series cheese was made by using a large quantity of rennet (6 oz. per 1,000 lbs. of milk), cooking to 94° instead of to 98°, and using a small quantity of salt (2 lbs. per 100 lbs. of curd), and compared with cheese made in the ordinary manner. An increase of 1.1 per cent in the yield of cheese resulted from using an extra amount of rennet, cooking to a lower temperature, and using less salt when the cheese was ripened in the ordinary curing room; and an increase of 2.1 per cent when ripened in cold storage. Cheese made in this way, however, did not score as high as cheese made in the ordinary manner.

In the fifth series less salt was used than ordinarily and the cheese was ripened in cold storage. Salting at the rate of $2\frac{3}{4}$ lbs. per 100 lbs. of curd decreased the yield slightly, but improved the quality as compared with salting at the rate of $2\frac{1}{4}$ lbs.

In the sixth series boxing cheese directly from the press, or after remaining one week in an ordinary curing room, and ripening in cold storage was compared with ordinary methods of handling. The cheese put in boxes directly from the press and ripened in cold storage scored highest. "The results indicate very forcibly that cheese may be put into a dry, clean cheese box directly from the press, or after being one week in an ordinary ripening room, and then be put in cold storage at an average temperature of 38 to 40° and 90 per cent humidity with very satisfactory results."

The results of the seventh series indicated that the use of formalin is effective in preventing the growth of mold. The method, however, is not considered very satisfactory on account of the expense.

Further experiments were made during 1902 in coating cheese with paraffin. The cheeses were dipped directly from the press and at the end of 1, 2, and 3 weeks, and ripened in an ordinary curing room and in cold storage. As regards the appearance of the cheese, the best results were obtained by dipping after about one week and placing in cold storage. There was no great difference as regards the quality of the cheese. Paraffining reduced the loss from shrinkage, the cheese dipped directly from the press and cured in cold storage losing practically nothing in weight during 1 month, while cheese dipped at the end of 1 week lost 0.78 per cent; dipped at the end of 2 weeks, 1.57 per cent; dipped at the end of 3 weeks, 2.36 per cent; and cheese not coated, 3.16 per cent. The authors state that so far as their work has gone they are not prepared to recommend the general paraffining of cheese to the ordinary factoryman.

No white specks were observed in cold-cured cheese, which is attributed to the fact that the temperature was not allowed to fall below the freezing point.

Determinations were made each month during the season of the total nitrogen, nitrogen in soluble form, and ammonia in cheese ripened in cold storage and in the curing room. During the first month 9.9 per cent of the total casein in the cheese in cold storage was changed to soluble compounds, while 17.6 per cent of the casein in the cheese in the curing room was rendered soluble. For the first 2 months the percentages were, respectively, 12.6 and 23.1, after which the average monthly gain for the cheese in cold storage was 2.06 per cent, and for the cheese in the curing room 1.95 per cent. Judging from the rate of formation of soluble compounds, the cheese in the curing room ripened about as much in 1 month as the cheese in cold storage did in 4 months. The rate of formation of ammonia compounds corresponded closely to the rate of decomposition of casein. Cheese made during June, July, and August contained more soluble compounds when taken from the press than cheese made in the spring and fall. The rate of ripening in both cold storage and in the curing room was also more rapid than that of cheese made during the other seasons. The use of $2\frac{3}{4}$ lbs. of salt per 100 lbs. of curd as compared with the use of $2\frac{1}{4}$ lbs., decreased the amount of moisture in the cheese by nearly 1 per cent and retarded the rate of ripening.

The appearance of strictly anaerobic butyric-acid bacilli and other anaerobic forms in hard cheese, E. von Freudenreich (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 10–11, pp. 327–330; Rev. Gen. Lait, 3 (1904), No. 12, pp. 265–268*).—The author does not believe that anaerobic bacteria reported by Rodella (E. S. R., 15, p. 401) as occurring regularly in hard cheese have anything to do with the ripening process. Similar experiments were made by him in 1895 and 1896,[a] the results of which indicated that strictly anaerobic bacteria were

[a] Centbl. Bakt. u. Par., 2. Abt., 1 (1895), No. 24, p. 854; 2 (1896), No. 10–11, p. 316.

not numerous in cheese, although they might be found in all cases by the use of large quantities in the preparation of cultures.

In 0.5 gm. of cheese the anaerobic forms were not regularly present, while the lactic-acid bacteria numbered millions. In only one instance has the author found anaerobic bacteria belonging to the class producing butyric-acid fermentation present in large numbers, and the eating of this cheese caused the sickness of a number of persons. The strictly anaerobic bacteria as well as the Tyrothrix forms are believed to be found in cheese only as accidental infections and of no importance in cheese ripening.

Studies on the micro-organisms of Swedish cheese, Gerda Troili-Petersson (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), Nos. 4–5, pp. 120–143; 6–7 pp. 207–215, pls. 3*).—Bacteriological studies were made of the common farm cheese of Sweden (Herrgårdsost) which is very similar to the Emmenthaler. Descriptions are given of the 38 species of bacteria, yeasts, and fungi found. Strictly anaerobic bacteria were only exceptionally found. Tyrothrix forms were present only in very small numbers. *Oidium lactis* was found only once. Lactic acid and peptonizing bacteria were present, the former predominating toward the end of the ripening process. Rennet-producing staphylococci were found, as were also several species of yeasts. Gas-producing bacteria were present in small numbers. The yeasts, peptonizing micrococci, and certain bacteria were common only in the early stages of the ripening process. The total number of bacteria was greatest in fresh cheese and tended to diminish with the age of the cheese. Bacteria were not found to be evenly distributed throughout the cheese, but formed colonies varying greatly in form and size. It is the author's intention to study further the relation of the different micro-organisms to the process of cheese ripening.

A comparison of the bacterial content of cheese cured at different temperatures, F. C. Harrison and W. T. Connell (*Ontario Agr. Col. and Expt. Farm Bul. 130, pp. 24*).—This has been noted from another source (E. S. R., 15, p. 717).

Cheese making, L. Anderson (*California Sta. Rpt. 1902–3, pp. 119–121*).—Brief notes are given on instruction at creameries and cheese factories by representatives of the station, and on the results of the first trial in making cheese by students in in the dairy school. The cheese was scored by a well-known expert and by a commercial firm, and the results were considered very encouraging to the enterprise.

Proceedings of the ninth annual meeting of the Georgia Dairymen's Association, 1903 (*Proc. Georgia Dairymen's Assoc., 1903, pp. 43*).—This contains the addresses delivered at the meeting held at Athens, Ga., August 4 and 5, 1903. G. W. Holmes discussed the subject of practical dairying, making suggestions concerning the selection, care, and feeding of cows and the handling of milk. B. W. Hunt discussed the addition of phosphates to cattle rations, stating that his practice was to give one-half ounce of phosphate of lime to each cow several times per month. W. A. Henry discussed the subject of agricultural education, paying particular attention to the work being done by the University of Wisconsin; and also the subject of feeding stuffs, with special reference to Georgia conditions. I. C. Wade expressed his views concerning the model dairy cow, and discussed in a general way dairying in the South. C. L. Willoughby pointed out ways of lessening the cost of dairy production, emphasizing particularly the importance of growing more feeding stuffs rather than purchasing commercial feeds. B. W. Hunt urged the putting forth of greater efforts in the extermination of the cattle tick (*Boophilus bovis*).

VETERINARY SCIENCE AND PRACTICE.

Veterinary science and bacteriology, A. R. WARD (*California Sta. Rpt. 1902-3, pp. 114-118*).—In 1901 a study was made of an outbreak of hog cholera at Red Bluff. Texas fever caused considerable loss to dairymen in Orange County. An investigation was made of the causes of ropy milk and scours in calves. Verminous bronchitis in calves was treated by the administration of the usual remedies by intratracheal method as well as by inhalation and by way of the mouth. No noticeable results were produced. By an act of the California legislature a poultry experiment station has been established at Petaluma and work is being carried on at this place in the study of poultry diseases. This investigation is prosecuted in cooperation with V. A. Moore.

Annual report of the civil veterinary department, Bengal, 1902-3 (*Calcutta: Bengal Secretariat Press, pp. 18, pl. 1*).—Notes are presented on veterinary dispensaries in various parts of Bengal and on the prevalence and treatment of glanders, rinderpest, and other diseases. Brief notes are also given on the condition of the Bengal Veterinary College.

Report of the chief inspector of stock and brands, C. J. VALENTINE (*Rpt. Min. Agr. South Australia, 1903, pp. 38-42*).—Brief notes on ticks, lice, worms, and foot rot in sheep; pleuro-pneumonia, tuberculosis, and actinomycosis in cattle; and various diseases of horses, camels, and hogs.

Generalized tuberculosis in cattle, SCHROEDER (*Berlin. Tierärztl. Wchnschr., 1903, No. 30, pp. 471, 472*).—An examination of cases of generalized tuberculosis showed that the meat was in good condition, while the lungs, liver, portions of the ribs, and other structures were extensively affected by the disease. The lymphatic glands and other structures around the joints were so greatly altered that lameness was produced as a result.

The infectiousness of milk of tuberculous cows in the light of recent investigations, LYDIA RABINOWITSCH (*Centbl. Bakt. u. Par., 1. Abt., Ref., 34 (1903), No. 8-9, pp. 225-236*).—A critical review is presented of recent literature relating to this subject. While there is not an entire agreement in the results obtained by different investigators with the milk of tuberculous cows, it is concluded that the investigations thus far made indicate that the milk of such cows may be pathogenic for both children and young animals.

Tuberculosis caused by dead tubercle bacilli, N. PANOV (*Dissertation, Yuriev, 1902, pp. 134, pl. 1*).—The literature of this subject is critically reviewed in connection with a bibliography. The author's experiments were made on rabbits, and the tubercle bacilli were obtained from consumptive human patients. Rabbits were inoculated with cultures of dead tubercle bacilli and were later examined for the purpose of studying the histology of "necrotuberculosis." It was found that dead tubercle bacilli contained positively chemotactic toxins which developed other active properties in direct contact with the living cells. These toxins cause the formation of tubercles, which at first become necrotic in the center, but later exhibit degeneration and proliferation of connective tissue. When introduced into experimental animals in large quantities dead tubercle bacilli may cause death, and when inoculated by the subcutaneous method they produce suppuration.

Intestinal tuberculosis in sheep, T. MICUCCI (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 35, pp. 817, 818*).—On account of the comparative rarity of this disease in sheep, detailed notes are given on a case of intestinal origin in which the liver was enlarged and cirrhotic and infested with flukeworms. The organ was also permeated with tubercles. The lymphatic glands of the liver were hypertrophic and somewhat degenerated. The lungs and other abdominal organs, except the

liver, were in a normal condition. A bacteriological examination of the tubercles in the liver showed the presence of numerous tubercle bacilli.

Culture of the tubercle bacillus on yolk of egg and gelose, F. Bezançon (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 16, pp. 603–605*).—Notes are given on the behavior of the tubercle bacillus on this medium when maintained at a temperature of about 38° C., with special reference to the variability of the tubercle bacillus.

The valuation and slaughter of tuberculous animals, Loze (*Jour. Agr. Prat.* [*Toulouse*], *99 (1903), No. 4, pp. 211–215*).—Brief statistics are given on the prevalence of tuberculosis in France and on the legal procedure in the payment of indemnities for cattle slaughtered on account of infection with tuberculosis.

Diagnosis of anthrax, Krüger (*Berlin. Tierärztl. Wchnschr., 1903, No. 22, pp. 353–355*).—This article is of a controversial nature and in it the author seeks to show that bacteriological examination of tissues of animals affected with anthrax is not a reliable means of diagnosing this disease. In many instances a most careful examination of tissues has failed to show the presence of the anthrax bacillus. It is urged that all other means of diagnosis should be used in conjunction with the bacteriological test.

The transmission of anthrax on tanned leather, S. V. Obukhov (*Arch. Vet. Nauk. St. Petersburg, 33 (1903), No. 10, pp. 1030, 1031*).—A harness which had been on a horse that had recently died with anthrax was placed on a healthy horse, with the result that the latter animal subsequently contracted anthrax. The author had success, however, in treating the case by antisepsis of the anthrax swellings and internal use of sodium salicylate.

Cutaneous infection with anthrax bacilli, A. Treutlein (*Centbl. Allg. Path. u. Path. Anat., 14 (1903), No. 7–8, pp. 257–264*).—In the author's experiments 2 rabbits were used in testing the possibility of cutaneous infection. Small areas of skin were carefully shaved, so as not to cause any lesion or reddening. Anthrax cultures were then rubbed upon the skin by a sterilized cork. The rubbing was done gently and with very slight pressure. Infection took place, and the animals died after 3 and 4 days, respectively. The anthrax bacilli penetrated through the hair follicles, from which they penetrated into the lymphatic spaces and later into the blood system. Attention is called to the significance of the results of this experiment in explaining the etiology of anthrax in men engaged in tanning and similar commercial occupations.

Vaccination against blackleg, D. G. Guccione (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 23, pp. 591–595*).—In the author's experience in the use of Arloing's method of vaccinating for blackleg, 301 cattle were vaccinated, and of this number only 1 died with the disease. Of 28 control animals, however, maintained under the same conditions, 5 died. The method is believed to be perfectly harmless, and it is recommended that cattle be vaccinated at the age of 6 months, preferably in the free end of the tail.

Vaccination against blackleg, E. Bastianini (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 30, pp. 697–699*).—Statistics are given on 3,621 cattle vaccinated for the prevention of blackleg. Of this number only 8 died. The method of vaccination used was that proposed by Arloing, and in the author's opinion this method is very effective and harmless.

The rational treatment of hemoglobinuria of cattle, Evers (*Berlin. Tierärztl. Wchnschr., 1903, No. 52, pp. 793–797*).—During the author's practice post-mortem examinations were made on 96 cattle which had died of this disease, and the conclusion was reached that the death of affected animals and all pathological alterations of various organs were to be ascribed to the destruction of the hemoglobin. The pathological symptoms disappeared as soon as the normal quantity of hemoglobin was restored. The author therefore undertook experiments for the purpose of testing

the effect of the artificial introduction of hemoglobin into cattle affected with this disease. Pure hemoglobin was purchased for this purpose and was prepared in tablets weighing 2 gm. each. During the year 1903, 43 cattle were treated in this manner, and of this number 41 recovered completely. The 2 animals which died were some distance from town and could not be treated so carefully as the other cattle. The hemoglobin was dissolved in physiological salt solution in the proportion of 1 to 50 during the first experiments, but later the percentage of hemoglobin was considerably increased. Detailed notes are given on a number of cases in which this treatment was applied. The hemoglobin was injected hypodermically and no test was made of intravenous injections. Animals submitted to this treatment recovered very rapidly, usually within from 5 to 8 days. The author believes that while hypodermic injections of hemoglobin may not cure all cases of Texas fever, it may be depended upon to give very satisfactory results in the majority of cases when administered carefully.

A disease of cattle in German East Africa resembling Texas fever, A. BRAUER (*Berlin. Tierärztl. Wchnschr., 1903, No. 27, p. 424, figs. 3*).—In various parts of German East Africa the author had occasion to observe a disease which closely resembles Texas fever in clinical symptoms. The elevation of temperature is at first rather slight, but finally reaches 42.8° C., or more. The pulse and respiration are rapid and the rate of mortality is about 50 per cent. The blood parasites appear in the early stages in the form of cocci, which are present in the blood corpuscles in considerable numbers.

Texas fever and tsetse-fly disease in West Africa, ZIEMANN (*Deut. Med. Wchnschr., 29 (1903), No. 16, pp. 289, 290*).—Redwater and blackwater are said to be local names of Texas fever, and are due to symptoms which are noted in a certain percentage of cases. In the control of Texas fever the author recommends the destruction of the ticks on infected animals and the vaccination of calves during the first two or three days of life. Vaccinated calves show small parasites in a typical form in the blood within five or six days after vaccination, but do not show hemoglobinuria or other symptoms of the disease. As a result of vaccination, a high grade of immunity is shown toward natural infection. Notes are also presented on the prevalence of tsetse-fly disease and bovine malaria in West Africa.

Tsetse-fly disease in Kamerun, ZIEMANN (*Deut. Med. Wchnschr., 29 (1903), No. 15, pp. 268, 269*).—During a study of this region with reference to the occurrence of tsetse-fly disease, the author found that the disease prevailed greatly in the interior, while the coast region was uninfected. Attention is therefore called to the desirability of regulating traffic in domesticated animals between these two regions. It is stated that the tsetse-fly disease is one of the chief causes of the present unthrifty condition of animal industry in Kamerun.

The susceptibility of mammals to tsetse-fly disease, E. MARTINI (*Deut. Med. Wchnschr., 29 (1903), No. 32, pp. 573–575, fig. 1*).—Tsetse-fly disease has already been shown to be infectious for most of the larger domesticated mammals, and also for the small experimental animals. The author tried a number of experiments in the inoculation of goats and zebras, and found that these animals were subject to a fatal form of the disease.

The rôle of ticks in the propagation of piroplasmoses, MÉGNIN (*Compt. Rend. Soc. Biol. Paris, 55 (1903), Nos. 1, pp. 4–6; 4, pp. 147–149; 5, pp. 175, 176*).—The author's investigations related to carceag of sheep and other protozoan diseases, and led him to the conclusion that ticks were as a rule not responsible for carrying these diseases. It is argued that the adult female is the only form which can transmit the disease, and that after it once detaches itself from an animal it does not seek for another host. It appears doubtful to the author, therefore, whether ticks can be considered as agents in the transmission of these diseases. It is urged that attention should be directed to the possible agency of certain biting Diptera.

The article is of a highly controversial nature, and an attempt is made to throw doubt upon the arguments advanced by A. Laveran in favor of the agency of ticks in transmitting these diseases. The species of ticks considered in the controversy are *Rhipicephalus annulatus*, *R. bursa*, and *R. sanguineus.*

The agency of ticks in the propagation of piroplasmoses, A. Laveran (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 2, pp. 61–63*).—The author agrees with Mégnin to the extent of admitting that a large proportion of the adult female ticks after they have fallen to the ground do not seek for another victim. It is argued, however, that the agency of ticks in the transmission of certain protozoan diseases, such as Texas fever, must be admitted, since it has been demonstrated by numerous observations, and the probability of ticks being instrumental in transmitting other protozoan diseases is greatly strengthened by recent investigations.

Piroplasmosis and hemoglobinemia in dogs, G. Szoyka (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 25, pp. 234–236*).—The author had occasion to examine 2 cases of hemoglobinemia in dogs. The clinical symptoms of these cases are described in detail. Blood was taken from both dogs and used in inoculation experiments. The results of these experiments showed that the blood was not virulent and that no blood parasites were present. The disease was therefore not due to piroplasma, and the author considers it necessary to assume that dogs are subject to a hemoglobinemia which is clinically not distinguishable from the form caused by piroplasma.

The rôle of ticks in the development of carceag, Motas (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 14, pp. 501–504*).—According to the author's experiments, the larvæ and nymphs of *Rhipicephalus bursa*, even when born of mother ticks gorged with the blood of diseased sheep, are incapable of transmitting carceag. It is only the sexually mature tick which is capable of transmitting the disease. Eggs obtained from ticks gorged with the blood of diseased sheep contain the specific protozoan, but this organism must undergo further development before it is capable of producing the disease.

Serum therapy for foot-and-mouth disease, D. Bernardini (*Clin. Vet., 26 (1903), No. 18, pp. 105–107*).—An outline is given of the method used by Nocard in controlling this disease by vaccination. In the author's opinion the immunizing effect of a vaccine persists only for a short time.

The treatment of aphthous and healthy cattle and horses with corrosive sublimate, F. Boschetti and A. Titta (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), Nos. 8, pp. 182–184; 9, pp. 198–203; 10, pp. 230–232; 11, pp. 241–245*).—Healthy cattle, also cattle affected with foot-and-mouth disease were treated with hypodermic and intratracheal injections of corrosive sublimate. The same drug was administered to horses by the intratracheal, hypodermic, and intravenous methods. Detailed notes are given on the reactions produced in the various experimental animals and the pathological lesions produced by the corrosive sublimate are carefully described.

As a result of the authors' experiments it is concluded that corrosive sublimate in the treatment of foot-and-mouth disease in cattle, whether administered by the intravenous, hypodermic, or intratracheal methods, and whether given in small, medium, or large doses, produces an elevation of temperature within from 15 to 30 minutes, instead of a lowering of temperature as maintained by Baccelli. General trembling and nervous disturbances together with pathological lesions are also observed. The toxic effects of corrosive sublimate are very marked in some cases, and include the general symptoms of mercurialism, such as inappetence, prostration, and fluctuations in temperature. The results are the same by whatever method the corrosive sublimate is administered.

The spread of the infectious processes is not checked by the administration of the corrosive sublimate. It was also found that different animals reacted differently to the drug, so that the doses could not safely be measured out according to the weight of the animal. Corrosive sublimate was endured rather better by horses than by

cattle, but did not give satisfactory results in controlling the disease. On account of the danger connected with the use of corrosive sublimate in the treatment of foot-and-mouth disease the authors recommend that it be entirely disregarded in favor of other remedies.

Parturient apoplexy (*Bd. Agr. and Fisheries [London], Leaflet 96, pp. 2*).—Notes are given on the symptoms, methods of prevention, and treatment of this disease. In cows which are predisposed to the disease it is recommended that iodid of potash infusion be given immediately after calving, whether the symptoms of the disease have appeared or not.

Parturient paresis in cows, HOHMANN (*Berlin. Tierärztl. Wchnschr., 1903, No. 23, pp. 361–364*).—The author briefly reviews the various theories which have been proposed in explanation of this disease. An examination of a number of cases showed that the uterus was never contracted, as has been claimed by several writers, and that an obstruction to the flow of blood in the jugular vein did not cause hyperemia of the brain. Experiments were tried in which the normal circulation of the blood was interfered with in various ways, for the purpose of testing the influence of such artificial interference upon the blood pressure and the cerebral activity of the animals.

It was found to be impossible to produce any pronounced effect upon the brain action by ordinary means used in altering the blood circulation. The author believes that the essential lesions of the disease do not occur in the musculature, since meat of animals suffering from parturient paresis has been shown to be a harmless food material. The author believes that the symptoms of this disease closely resemble those of eclampsia and may be due to extensive disturbances in the nervous control of the blood circulation. In the experience of the author all cases of this disease must be considered as of a serious nature and likely to prove fatal if evidence of paralysis of the medulla oblongata appears before any remedies are applied.

In treating the disease the author recommends that the animal be maintained in a position so that it rests upon all 4 legs, that the head be kept in an upright position, and that cold applications be made to the head and neck. If there is evidence of paralysis of the brain it may be well to give subcutaneous injections of spirits of camphor or caffein. These operations should always be associated with the application of the Schmidt method and treatment by means of compressed air.

Treatment of parturient paresis by means of oxygen, A. ZEHL (*Berlin. Tierärztl. Wchnschr., 1903, No. 30, pp. 469–471*).—The author treated 9 cases of this disease with oxygen, and gives detailed notes on the history of all these cases. A complete recovery took place in all cases and the author believes that this method is perhaps most satisfactory in the treatment of parturient paresis. In the author's experience this disease develops in cows which have been dry for a few weeks previous to calving, and never occurs in cows which are milked up to the time of parturition. The author believes, therefore, that a long dry period before calving must be considered a predisposing cause of the disease. The beneficial effects of oxygen are regarded as due to the purely mechanical action of such treatment.

Infectious pneumo-pleuritis in calves, EVERS (*Berlin. Tierärztl. Wchnschr., 1903, No. 17, pp. 277, 278*).—The author tested the effect of Collargol in the treatment of diarrhea of calves, but found during these experiments that while the diarrhea yielded promptly to this treatment a large proportion of the calves died later of pneumo-pleuritis. This disease appeared in a number of localities in an epizootic form and attacked calves varying in age from 8 days to 4 months. In young calves death occurred within 4 days after the outbreak of the disease, while in older animals the course of the disease was somewhat prolonged.

The pathogenic findings in cases of this disease varied according as the disease assumed a chronic or acute form, but resembled in a general way those of swine plague. In young calves affected with the acute form of the disease the pathological

lesions were confined almost entirely to the lungs. Experiments were made in controlling this disease by vaccination with Septicidin. During his experiments 5 calves were treated and exposed to infection, but exhibited a perfect resisting power to the disease. Calves which have already exhibited the first symptoms of the disease may be successfully treated in some cases by the administration of from 5 to 30 cc. of Septicidin, while 10 cc. is sufficient for immunizing purposes.

Hydrotherapy in pneumonia, G. Giugiaro (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 36, pp. 841–847*).—The author recommends, as a result of experiments in treating pneumonia, that the use of vesicants be discontinued as more or less harmful and ineffective. It is also recommended that less dependence be placed upon chemical febrifuges, such as quinin, since these remedies exercise an irritating action upon the stomach, nervous system, and kidneys. In the place of vesicants and febrifuges the author recommends the use of cold and hot water compresses upon the thoracic region, according to the nature and stage of the disease.

Pulmonary actinomycosis, M. Schlegel (*Berlin. Tierärztl. Wchnschr., 1903, No. 26, pp. 409–411*).—A detailed description is given of the alterations in cases of actinomycosis in the laryngeal glands, and in the lungs and pleura. In the foci of this disease upon the bronchi and bronchioles inflammatory processes are most pronounced, the walls of the bronchi are greatly thickened, and actinomycotic masses are distributed through them. The author believes that infection in the lungs is spread through the bronchioles and lymphatic vessels. Pulmonary actinomycosis in Germany appears to be more prevalent than has heretofore been supposed.

Aspergillosis in cattle, A. Bartolucci (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 21, pp. 490–492*).—A number of cattle were affected with what the author suspected of being aspergillosis. The symptoms of the disease are described in some detail. The chief lesions were found in the lungs, in which there were characteristic areas of hepatization and inflammatory infiltration of the interlobular connective tissue. The spores of *Aspergillosis fumigatus* were found in these foci.

The working of the Scab Act, A. G. Davidson (*Agr. Jour. Cape Good Hope, 23 (1903), No. 5, pp. 558–570*).—The Scab Act of Cape Colony was passed in 1894 and amended in 1899, but has never given satisfaction. The causes of failure to eradicate scab are outlined by the author.

It is stated that sheep raisers have failed to show a hearty cooperation in the enforcement of the law and many scabby sheep thus escape treatment. A number of badly infested localities exist, and sheep after dipping are allowed to travel over such localities and become reinfested. Another cause of the prevalence of sheep scab is the careless manner in which the dipping operations are performed. In localities where the best trained and most competent men have been sent as inspectors the best results have been obtained. The author recommends the appointment of sheep inspectors by the government, the dipping of all stock under supervision, the enforcement of strict regulations regarding the removal of stock, systematic treatment of infested corrals and premises, and a system of brands to be used in identifying treated sheep.

Sorghum poisoning, W. Maxwell (*Queensland Agr. Jour., 13 (1903), No. 5, pp. 473, 474*).—The presence of hydrocyanic acid in sorghum has been demonstrated, and the quantity of the poison appears, according to the investigations of the author, to be dependent upon the nature of the soil upon which the sorghum is grown. On soil rich in nitrogenous elements the quantity of hydrocyanic acid is largest.

Some stock-poisoning plants of North Dakota, L. Van Es and L. R. Waldron (*North Dakota Sta. Bul. 58, pp. 319–354, figs. 7*).—The authors discuss the conditions under which stock most frequently become poisoned with native plants. Notes are also given on methods of preventing plant poisoning, as well as on chemical, mechanical, and physiological antidotes. The more important known or suspected of being poisonous plants in North Dakota are chosen for special discussion. These include

Cicuta maculata, *Sium cicutæfolium*, wild parsnip, *Delphinium carolinianum*, loco weeds, death camas, swamp camas, lupines, and ergot. The remedies usually recommended for the treatment of animals poisoned with these plants are discussed and notes are given on the distribution of each species and the possibility of eradicating them.

The action of bile, corrosive sublimate, and formalin on hydatids, F. Devé, (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 2, pp. 75–79*).—In general, bile was supposed to possess considerable power in the destruction of hydatids, and experiments were made to test this action. It was found that hydatids were capable of living for a considerable time in the abdominal cavity in spite of the prolonged presence of bile. In some cases the scolex resisted the action of bile completely and proceeded to undergo its usual developmental stages.

In experiments on echinococci the author found that corrosive sublimate (1: 1,000) or formalin (1: 200) would destroy the motility of these organisms within a period of 2 or 3 minutes. Further experiments were made with the scoleces of hydatids, during which corrosive sublimate and formalin were employed at the same strength. It is concluded from these experiments that echinococci are destroyed by 5 minutes' exposure to corrosive sublimate (1: 1,000) or formalin (1: 100).

Malignant catarrhal fever of cattle and the use of meat from animals affected with this disease, S. de Benedictis (*Clin. Vet., 26 (1903), Nos. 8, pp. 45–48; 10, pp. 57–60*).—A description is given of the condition of the meat observed in various cases of this disease, with special reference to lesions in the musculature. The author states that it is to be deplored that such contradictory legal decisions have been given regarding the enforcement of the law in such cases. The meat is believed to be highly unsanitary.

Intestinal coccidiosis in cattle, N. Pieroni (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 7, pp. 152–156*).—A number of cases of this disease were observed, and detailed notes are given on the post-mortem findings in 1 case. No other lesions were found except in the walls of the intestines, in which there were numerous foci of an infection, especially in the mucous coat of the lower portion of the alimentary tract. The author believes that the pathogenic organism in this case is *Coccidium oviforme*.

Meat products in Naples in 1902, L. Granucci (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 38, pp. 889–899*).—Brief notes are given on various causes of condemnation of meat as observed during the course of inspection of meat and meat products in Naples. Tuberculosis was observed in buffalo meat; echinococci in the spleen of cattle, hogs, and sheep; fibro-sarcomata in the diaphragm of cattle; and notes are also given on various tumors found in meat and vital organs. The various pathological findings in the meat sold in the markets of Naples are presented in a tabular form.

The distribution of Cysticercus bovis in Italian meat products, A. Boccalari (*Gior. R. Soc. Accad. Vet. Ital., 52 (1903), No. 18, pp. 409–415*).—Statistics are given showing the percentage of infestation by this parasite in beef coming from various provinces of Italy. It is suggested that infested meat be subjected to a low temperature for the purpose of destroying the parasites.

Contagious coryza, Weber (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 42, pp. 391, 392*).—The author describes the symptoms and course of this disease in 2 horses which came under his observations. There was great difficulty in respiration in both cases, and in one case it was found necessary to water the animal from a tube which was inserted into the esophagus. The parotid glands and also the glands at the entrance of the thorax were greatly swollen.

Ichthargan, Goldbeck (*Deut. Tierärztl. Wchnschr., 11 (1903), No. 33, pp. 307, 308*).—Ichthargan was used in the treatment of malignant edema in the horse. It was injected intravenously in a solution in water at the rate of 1: 40, and in quantities of 4 gm. daily. Better results were obtained from the use of this remedy than from Collargol.

Ichthargan and its use in veterinary medicine, Müller (*Berlin. Tierärztl. Wchnschr., 1903, No. 24, pp. 385–388*).—The author employed this remedy first in the treatment of pneumonia in horses. The remedy was applied in a 3 per cent aqueous solution intratracheally, and caused a rapid improvement in all the animals treated within a very short time. Good results were also obtained in the use of Ichthargan in the treatment of angina in horses, malignant cartarrhal fever in cattle, and swine plague. The use of this drug in the treatment of periodical ophthalmia was without good results.

The therapeutic use of Ichthargan, R. Eberhardt (*Berlin. Tierärztl. Wchnschr., 1903, No. 21, pp. 337–343*).—This drug was used by the author in the treatment of a number of skin diseases as well as in 7 cases of influenza. In the treatment of eczematous skin diseases of the horse and herpes tonsurans of cattle excellent results were obtained by the use of Ichthargan. In all the cases of influenza the drug caused the lowering of the temperature almost to the normal, and when the temperature rose again on the succeeding days it was readily controlled by the intratracheal application of Ichthargan.

The value of Crede's silver preparation in the treatment of morbus maculosus in the horse, O. Fettick (*Deut. Tierärztl. Wchnschr., 11 (1903), Nos. 34, pp. 317–320; 35, pp. 325–328*).—The author reviews in a critical manner the literature of this subject and gives a detailed account of the use of colloidal silver in the treatment of 16 cases of morbus maculosus. It was found that even while this remedy was applied during the early stages of the disease, the symptoms became worse and the disease ended fatally in a large percentage of cases. In some cases the swellings were somewhat reduced and the petechiæ became paler, but the same results were observed not only in cases where colloidal silver was not used, but even when no treatment whatever was administered. The author concludes therefore that colloidal silver is not a specific for morbus maculosus.

Composition of some prominent veterinary proprietary remedies, S. Avery (*Agriculture [Nebraska], 2 (1903), No. 9, pp. 16–19*).—A number of proprietary remedies used as dips and for preventing the attack of flies, curing hog cholera, etc., were analyzed. All of these remedies are sold at prices much higher than the actual cost of materials requires. A number of them were found to be quite ineffective.

The nuisance of patent medicines, J. Schmidt (*Deut. Tierärztl. Wchnschr., 11 (1903), Nos. 43, pp. 401–403; 44, pp. 409–411*).—A list is presented of a large number of proprietary medicines, together with brief notes on the unfounded claims which are made by the manufacturers regarding the efficacy of these medicines. In the control of this nuisance the author believes that the first necessary step is the proper information of the public regarding the worthlessness of such remedies, and the passage of laws forbidding their sale. Such a law has already been adopted in Bavaria.

Hog cholera, N. S. Mayo (*Industrialist, 30 (1903), No. 8, pp. 120–122*).—Attention is called to the great economic importance of hog cholera throughout the corn-raising section of the country. At least 3 contagious diseases are commonly referred to as hog cholera. In Kansas a law has been passed requiring owners to bury or burn within 24 hours all hogs that have died of hog cholera.

Observations on swine erysipelas, swine plague, and hog cholera, Träger (*Berlin. Tierärztl. Wchnschr., 1903, No. 25, pp. 394–403*).—Swine erysipelas is said to be on the increase in various parts of Germany and some evidence of increase has been obtained for swine plague and hog cholera. The number of animals vaccinated for the prevention of these diseases has greatly increased during the past few years and the results of such vaccinations are highly satisfactory. In the control of contagious diseases of hogs the author believes that compulsory notification occupies an important place, and attention is also called to the necessity of more strict measures of

disinfection after outbreaks of contagious diseases. The author described some of the difficulties met with in persuading the more ignorant farmers of the necessity and harmlessness of known methods of vaccination. The prejudice of such farmers against vaccination sometimes leads to the unnecessary distribution of the disease through not complying with legal regulations regarding such matters.

A contribution to the identity of swine erysipelas and urticaria, H. Schmidt (*Berlin. Tierärztl. Wchnschr., 1903, No. 22, pp. 351, 352*).—Notes are given on a number of cases of these diseases which were diagnosed by the author. A history is given of a case of swine erysipelas in a sow, which was treated with swine erysipelas serum. Within 1 day after the last injection of serum 8 pigs were born of this sow, all of which exhibited the bluish-violet rectangular spots characteristic of the disease. It is believed that these cases are evidence of the possible congenital origin of swine erysipelas.

The period at which the organism of swine erysipelas and fowl cholera may be recognized in the internal organs of mice after hypodermic inoculation, T. Tiede (*Ztschr. Tiermed., 7 (1903), No. 1, pp. 41–67*).—There are 4 common methods by which this problem is studied, viz: By treating the point of inoculation with chemical disinfectants, with hot iron, by removing the tissue around the point of inoculation, and by killing and examining infected animals after periods of determined length. The author reviews in a critical manner the work which has been done by previous investigators on this subject in a study of anthrax, malignant edema, glanders, sheep pox, etc. From a study of this literature it appears that no general rules can be laid down regarding the time required for the penetration of bacteria from the point of infection into the internal organs. This period varies according to the virulence of the micro-organisms, the susceptibility of the experimental animals, and especially the method of inoculation. The author's experiments were confined to a study of the bacilli of swine erysipelas and fowl cholera, and the method followed consisted in inoculating the mice in the ear with virulent cultures and killing the experimental animals after definite periods have elapsed. The various internal organs were then carefully examined for the presence of bacteria. It was found during these experiments that the bacillus of swine erysipelas could be demonstrated in mice inoculated hypodermically as follows: In the spleen and liver after 15 hours; in the liver and lungs, and to some extent in the spleen, after 24 hours; and in large quantities in all organs after 48 hours. The organism of fowl cholera was found sparingly in the spleen, liver, lungs, and heart after 15 minutes; in considerable numbers in all organs after 45 minutes, and generally distributed in all organs after 4 hours. The quantity of bacilli increased constantly from this period until death took place.

Vaccination for swine erysipelas in 1902, Teetz (*Berlin. Tierärztl. Wchnschr., 1903, No. 19, pp. 304–306*).—In the author's experiments hogs were vaccinated with serum and immediately afterwards with an attenuated culture of the bacillus of swine erysipelas. In a number of cases in which the serum and culture were given simultaneously unsatisfactory results were obtained. A striking curative property was observed when dogs were inoculated with serum and cultures in rapid succession. In the locality where these experiments were made it was stated that Septicidin had given unsatisfactory results.

From the author's experience with swine erysipelas it is concluded that the disease appears in 3 forms: Simple erysipelas of the skin, urticaria, and a mixture of these 2 forms. The author believes that vaccination is unnecessary in the case of urticaria, since animals usually recover from this disease without treatment. In internal erysipelas no hope can be entertained of successful treatment, provided the skin already exhibits a pronounced red color. Vaccination with doses 4 or 5 times the ordinary size proved ineffective in such cases.

Report on vaccination for swine erysipelas in Saxony by the use of Lorenz vaccine, H. RAEBIGER (*Berlin. Tierärztl. Wchnschr., 1903, No. 22, p. 351*).—The Government has undertaken to pay indemnity for all losses caused by vaccination with the Lorenz vaccine prepared in the vaccine institute at Prenzlau. Indemnity was paid for all animals which died within 12 months after vaccination. Of the 165,000 vaccinated animals only 42 died of swine erysipelas. In the future it is recommended that all hogs which die with apparent symptoms of swine erysipelas be examined and that portions of the lungs, heart, spleen, or kidneys be sent to the vaccine institute for examination.

The most suitable position of hogs for vaccinating purposes, BURY and GOLDBERG (*Berlin. Tierärztl. Wchnschr., 1903, No. 22, pp. 350, 351*).—In the experience of the authors the best success and the least trouble was had in restraining hogs by means of a cord drawn through the mouth and fastened to the head.

The position of the hog during vaccination, PLATSCHEK and JOSEPH (*Berlin. Tierärztl. Wchnschr., 1903, No. 30, pp. 472, 473*).—Young pigs may be readily held in the hands by one assistant, while larger hogs may often be successfully vaccinated in comparatively dark and close quarters by rapid manipulations without the use of any throwing apparatus.

The etiology of rabies, A. RABIEAUX (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 2, pp. 91–93*).—The author conducted a number of experiments in an attempt to explain the cause of the virulence of the saliva of rabid animals. The saliva was obtained in a pure condition through the canal of Wharton. Numerous experiments were made in attempting to cultivate some organism from the virus thus obtained. These experiments were without results. It was found that when a virulent emulsion was injected into the aqueous humor of the eye of rabbits and dogs the virulence of the aqueous humor rapidly disappeared.

Treatment of tetanus with sodium iodid, E. GRAMS (*Berlin. Tierärztl. Wchnschr., 1903, No. 15, pp. 249–255*).—During the past 7 years the author treated 35 cases of tetanus by means of sodium iodid. As a rule this remedy was administered intratracheally in doses of 5 gm. in solution. Detailed notes are given on the effects of the drug in different cases.

The author believes as a result of his studies on tetanus that this disease is always of traumatic origin. The symptoms appear in most cases within 14 days after infection and it is believed that it is only in subacute cases that any hope of success may be had from treatment. The average course of the disease in subacute cases is about 30 days. In the treatment of the disease the author recommends careful attention to diet, the use of a slinging apparatus if necessary, and the administration of sodium iodid intratracheally, intravenously, *per os*, or *per rectum*. The quantity of the drug to be used is not of primary importance, but good results were obtained by the author from the use of 2 to 3 gm. dissolved in 10 gm. of water and administered immediately after infection and daily for 2 or 3 days thereafter.

Tetanus in dogs, GRUNAU (*Berlin. Tierärztl. Wchnschr., 1903, No. 29, p. 458*).—On account of the rarity of typical cases of this disease in dogs the author gives brief notes on cases which he has observed. In a case which resulted from wound infection the head was held stretched out in a straight line and considerable difficulty in swallowing was manifested. The case exhibited pronounced opisthotonus.

A pathogenic Streptothrix found in dogs, TROLLDENIER (*Ztschr. Tiermed., 7 (1903), No. 2, pp. 81–109, figs. 9*).—A detailed post-mortem examination was made on a dog which it was thought had been poisoned with strychnin or some other toxic substance. As a result of this examination it was found that some of the lymphatic glands were enlarged and caseous, while a pronounced inflammation was discovered in the membranes of the brain and in the kidneys. An organism was isolated from the diseased tissue and was cultivated on various nutrient media.

Inoculation experiments were also carried out on various experimental animals. It was found during these experiments that the organism was pathogenic for mice, guinea pigs, rabbits, and dogs, and slightly so for fowls, horses, calves, and cats. The morphology of this organism is described and notes are given on the pathology of the affected tissue. The organism, while referred to as a Streptothrix, is believed to be more properly referred to the genus Actinomyces, and the author therefore proposes the name *A. bicolor*.

Roup, an experimental study, F. C. Harrison and H. Streit (*Ontario Agr. Col. and Expt. Farm Bul. 132, pp. 48, figs. 25*).—For many years this disease has appeared in the poultry yards of the Ontario Agricultural College, usually during damp autumn weather. It causes a direct loss of from 10 to 15 per cent of fowls and attacks principally young birds. Detailed notes are given on the clinical symptoms and pathological lesions of this disease in various parts and organs of the body. In pathological material obtained from diseased birds the authors demonstrated the presence of *Bacillus cacosmus*, which is called the roup bacillus. Notes are given on the behavior of this organism on various nutrient media. The virulence of the roup bacillus, as first obtained was quite weak, but was increased by repeated passages through pigeons. Numerous infection experiments by different methods were carried out. It was found that in order to infect fowls experimentally it was necessary to use roup bacilli from a culture which had been freshly isolated. Pigeons when inoculated with a roup bacillus became infected and exhibited symptoms similar to roup in fowls. Extensive necrosis of muscle tissue was produced by inoculation with the roup bacillus. Feeding experiments with roup bacillus yielded negative results. Several attempts were made to immunize fowls and rabbits, but without any success. Inoculation experiments with *Bacillus pyocyaneus* showed that this organism is capable of producing chicken diphtheria, but that its virulence is soon lost by growing on ordinary culture media.

Treatment of fowl cholera by Septicidin, Schmidt (*Berlin. Tierärztl. Wchnschr., 1903, No. 27, pp. 421–423*).—An outbreak of this disease took place during the past season in a village near Dresden and spread rapidly, showing a high virulence. The author vaccinated 60 birds with Septicidin, including chickens and ducks. For each bird 1 cc. of the serum was used. On another estate 36 chickens, turkeys, and ducks were vaccinated with doses of 2 cc. of Septicidin. As a result of vaccination of these fowls the rate of mortality from fowl cholera was reduced to 5 per cent, while among birds which were not vaccinated the mortality was frequently 100 per cent. According to the author's experience Septicidin may be used also in the diagnosis of fowl cholera.

AGRICULTURAL ENGINEERING.

The testing of road materials, L. W. Page and A. S. Cushman (*U. S. Dept. Agr., Bureau of Chemistry Bul. 79, pp. 77, pls. 5, figs. 10*).—The main object of this bulletin is to describe in some detail the methods and work of the road-material laboratory of the Bureau of Chemistry of this Department established in December, 1900, and to give the results obtained up to the present time. "Incidentally, the physical, mechanical, and chemical agencies which act upon road materials are discussed and a brief history of the testing of such materials is given."

The principal activities of the laboratory are classified as follows: "(1) Tests for determining the quality of materials to aid road builders in selecting those most suitable for their work; (2) the investigation of various processes to develop simple, appropriate, and reliable tests; (3) the collection of data for use in drawing up specifications for standards of quality; (4) scientific research to develop new materials or mixtures, and the study of problems which may arise in road building.

"The most important work comes under the first head, for the main object of the

aboratory is to obtain results, by means of appropriate tests on small samples, which will agree sufficiently well with the results of practice to aid the road builder in selecting the most suitable materials from those available for his work."

The methods and tests used in the laboratory, which are described and for which data are in some cases given, include the abrasion, cementation, absorption, specific gravity, and weight per cubic foot, hardness, and compression and tensile strength tests of rock and gravel; and "rattler," absorption, cross-breaking, and compression tests for paving brick. In tests of cement the methods of the American Society of Civil Engineers are followed. The petrographic and chemical methods used in the examination of rocks for the purpose of classification are also described. The results of examinations of a large number of materials from different parts of the United States are given.

As regards the general question of the practical application of laboratory results the authors say:

"The proper interpretation and application of the results obtained in the laboratory are quite as important as the general accuracy and appropriateness of the tests themselves. It is probable that many engineers and others interested in the subject of road building who have found time to examine the question only superficially have misunderstood the bearing and value of road-material testing. In all cases the results obtained in testing materials of construction are of relative rather than absolute value. Even quite a large variation in the results yielded by different test pieces of the same sample should not condemn the practical value of the figures if they are properly applied and interpreted. . . .

"Given a number of materials for laboratory examination, it is not pretended that an actual practical grade of excellence can be established. On the other hand, if more than one material is available, it is quite possible for the laboratory to point out which one would yield the best results, both as to immediate excellence and length of life under known conditions of climate and traffic."

The farm railroad (tramway) and the results obtained with it on the Buhlendorf estate, REICHERT (*Fühling's Landw. Ztg., 52 (1903), Nos. 22, pp. 797–817, figs. 17; 23, pp. 852–864, figs. 7*).—The advantages of farm tramways in general are explained; the installation on the Buhlendorf estate, which is largely devoted to sugar-beet growing, is described; and the uses made of the tramways on this estate and the profits resulting from their use are discussed.

An example of thin macadam road construction along the Charles River, Massachusetts, J. A. HOLMES (*Engineer. News, 51 (1904), No. 2, pp. 32, 33, figs. 3*).

The construction of roads, paths, and sea defenses, F. LATHAM (*London: Sanitary Pub. Co., Ltd., 1903, pp. IV+221, figs. 57*).

The construction of terraces, E. LEPLAE (*Rev. Gén. Agron.* [*Louvain*], *12 (1903), No. 10, pp. 435–442*).—This is an extract from a course of instruction given at the agricultural institute of Louvain.

The possibilities of irrigation in South Africa, C. D. H. BRAINE (*Agr. Jour. Cape Good Hope, 24 (1904), No. 1, pp. 48–58*).—A general discussion of this subject.

Preliminary plans and estimates for drainage of Fresno district, California, C. G. ELLIOTT (*California Sta. Rpt. 1902–3, pp. 57–64, dgms. 2*).—A reprint of Circular 50 of this office (E. S. R., 15, p. 94).

The Cache River drainage survey, A. H. BELL (*Engineer. News, 51 (1904), No. 5, pp. 115, 116*).—This is a brief account of the preliminary operations of a commission appointed by the Governor of Illinois under the provisions of a recent bill passed by the legislature of the State for a survey of the Cache River to ascertain the practicability of straightening and deepening the channel of the river for the purpose of preventing overflow of the bottom lands and for the drainage of these lands.

The mitigation of floods in the Hunter River, J. H. MAIDEN (*Jour. and Proc. Roy. Soc. New South Wales, 36 (1902), pp. 107–131*). This article discusses the causes

of floods in Hunter River and suggests the following remedial and preventive measures: "(1) Intelligent control of ringbarking or felling; . . . (2) repair of little incipient rivulets by gradual replanting or placement of obstructions (logs, etc.); (3) planting of willows and other trees, shrubs, grasses, etc.; (4) chamfering of the banks; (5) fencing of banks; and (6) burning as much as possible of the dead timber and branches to prevent their finding their way into the water-courses and scouring the banks."

The composition of sewage in relation to problems of disposal, G. W. FULLER (*Tech. Quart., 16 (1903), No. 2, pp. 132–160*).—From a review of investigations relating to this subject the author reaches the conclusion that it is "questionable whether the amount of added knowledge which may be obtained from a continuance of present methods year after year is going to be commensurate with the cost. In fact, it seems that the time is approaching when it is worth while to consider a recasting of the program for sewage analyses. . . .

"In studying exhaustively the chemical and biological changes which take place in polluted waters, and the conditions under which putrefaction may be avoided, it is believed that the relative significance should be studied of the 'absolute oxygen-consuming powers' of the organic matter in sewage or effluent expressed in terms which can be readily appreciated; of the oxygen dissolved in the sewage or effluent, together with that which may be yielded by nitrates, sulphates, and other constituents of the liquid; of the oxygen similarly contained in the water into which the sewage or effluent is discharged; of the oxygen which may be received in the water by means of aeration and from higher forms of vegetable life; and of the absolute oxygen-consuming powers of the organic matter in the water of the stream and in the sediment on the bottom and sides of the stream itself. To these factors should be added the effect of the very important items of temperature and the period of time during which biological changes may take place."

Farm buildings, J. DANGUY (*Constructions rurales. Paris: J. B. Baillière & Sons, 1904, pp. 442, figs. 273*).

Barn plans and outbuildings (*New York: Orange Judd Co., 1903, pp. XVI + 388, pl. 1, figs. 374*).—A revised and enlarged edition of this book, first issued about 20 years ago, in which has been incorporated plans and descriptions of modern improvements in construction, ventilation, sanitation, etc., of farm buildings. The original edition was prepared largely by B. D. Halsted, the revised edition by E. C. Powell.

A new type of steam shovel (*Engineer. and Min. Jour., 77 (1904), No. 5, p. 205, fig. 1*).—The construction and operation of the Kilgore direct-acting steam shovel are discussed.

Fowler's steam disk plow (*Deut. Landw. Presse, 30 (1903), Nos. 98, p. 844; 102, p. 881, fig. 1*).—Brief notes on the construction and operation of this plow.

An automobile cultivator, G. CAYE (*Nature [Paris], 31 (1903), No. 1555, pp. 237, 238, figs. 2*).—A revolving "digger" drawn by an automotor is described.

Combined cultivators and seeders, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 7 (1904), No. 2, pp. 46–51, figs. 6*).—Various forms are described, with brief accounts of tests.

Cotton gins: The saw gin, F. MAIN (*Jour. Agr. Prat., n. ser., 6 (1903), No. 50, pp. 774–776, figs. 2*).—The construction and operation of this type of gin are discussed. A previous article (E. S. R., 15, p. 522) discussed roller gins.

Recent progress in the field of agricultural machinery, W. HEERBERGER, A. NACHTWEH, L. WROBEL, E. WROBEL, and W. STEEGER (*Fühling's Landw. Ztg., 52 (1903), Nos. 1, pp. 36–39, figs. 4; 2, pp. 76–78, figs. 2; 3, pp. 112–114, fig. 1; 4, pp. 190, 191, fig. 1; 6, pp. 223–228, figs. 6; 7, pp. 266–268, figs. 2; 8, pp. 300–303, figs. 3; 9, pp. 332–337, figs. 3; 10, pp. 367–372, figs. 6; 11, pp. 402–408, figs. 6; 12, pp. 433–447, figs. 9; 13, pp. 482, 483; 14, pp. 520–523, fig. 1; 15, pp. 554, 555, fig. 1; 16, pp. 594–596, figs. 2; 17, pp. 636–638, figs. 2; 18, pp. 684–686, figs. 3; 19, pp. 721, 722, figs. 2; 22, pp. 837–840, figs.

3; 23, pp. 889–892, figs. 5).—Notes are given on a self-feeding thresher, butter workers, portable engines, hand distributor for fertilizers, dust-proof plow hub, beet seed cleaning apparatus, thresher with simple cleaning device, sod plow, fan, coupling, clutch, seed cleaner and grader, steam plow (cable), safety device for threshers, plows, feed cutters, combined harvesting machines (mower and tedder, and wagon truck and rake), mowing machines, two-row beet digger, continuous milk cooler, horse rakes, beet harvesters, straw carrier for threshing machines, and steam boilers.

MISCELLANEOUS.

Fifteenth Annual Report of Arkansas Station, 1902 (*Arkansas Sta. Rpt. 1902, pp. 148*).—This includes the organization list of the station; a brief statement by the director concerning the publications of the station during the year; a financial statement for the fiscal year ended June 30, 1902; and reprints of Bulletins 71–76 of the station on the following subjects: Why apple trees fail (E. S. R., 14, p. 43); sweet-potato experiments (E. S. R., 14, p. 435); pork-production experiments and hog ranching (E. S. R., 14, p. 486); the phosphate rocks of Arkansas (E. S. R., 14, p. 430); alfalfa (E. S. R., 14, p. 433); and pig-feeding experiments with cotton-seed meal (E. S. R., 15, p. 68).

Report of California Station, 1902–3 (*California Sta. Rpt. 1902–3, pp. 222*).—This includes a financial statement for the fiscal year ended June 30, 1902; the organization list of the station; a general review of station work by the director; a report on farmers' institutes, by E. J. Wickson; numerous articles abstracted elsewhere; brief summaries of several of the bulletins issued by the station; reports of the California Substations; and a list of donations and exchanges.

Sixteenth Annual Report of Michigan Station, 1903 (*Michigan Sta. Rpt. 1903, pp. 73–293*).—This contains a financial statement for the fiscal year ended June 30, 1903; a report of the director on the work of the station during the year; departmental reports; meteorological observations noted elsewhere; and reprints of Bulletins 203–210 and Special Bulletins 17–19 of the station on the following subjects: Analyses of some of the commercial feeding stuffs of Michigan (E. S. R., 15, p. 67); mosquitoes and other insects of the year 1902 (E. S. R., 15, p. 61); report of South Haven Substation (E. S. R., 15, p. 38); notes on small fruits (E. S. R., 15, p. 42); sugar-beet experiments, 1902 (E. S. R., 15, p. 35); Michigan mushrooms (E. S. R., 15, p. 123); vegetable and bush fruits (E. S. R., 15, p. 252); fertilizer analyses (E. S. R., 15, p. 348); sugar beets in the Upper Peninsula (E. S. R., 15, p. 36); and spraying calendar (E. S. R., 15, p. 61).

Sixteenth Annual Report of Mississippi Station, 1903 (*Mississippi Sta. Rpt. 1903, pp. 31*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; and reports of the director and heads of departments containing outlines and some of the results of station work during the year. Parts of these reports are noted elsewhere. A brief summary of the work at the McNeill Branch Station, by E. B. Ferris, concludes the report.

Twenty-First Annual Report of New York State Station, 1902 (*New York State Sta. Rpt. 1902, pp. 473*).—This contains the organization list of the station; a financial statement for the year ended September 30, 1902; and reprints of Bulletins 212–229 of the station on the following subjects: Director's report for 1902 (E. S. R., 14, p. 1131); control of rusty spot in cheese factories (E. S. R., 14, p. 908); two unusual troubles of apple foliage (E. S. R., 14, p. 774); potato-spraying experiments in 1902 (E. S. R., 14, p. 875); raspberry cane blight and raspberry yellows (E. S. R., 14, p. 981); a destructive apple rot following scab (E. S. R., 14, p. 1088); a study of some of the salts formed by casein and paracasein with acids: Their relations to American Cheddar cheese (E. S. R., 14, p. 607); methods for the estimation of the

proteolytic compounds contained in cheese and milk (E. S. R., 14, p. 545); some of the compounds present in American Cheddar cheese (E. S. R., 14, p. 805); miscellaneous notes on injurious insects, II (E. S. R., 14, p. 62); treatment for San José scale in orchards: II, Spraying with kerosene and crude petroleum (E. S. R., 14, p. 470); San José scale investigations, IV (E. S. R., 14, p. 1094); variety test of strawberries (E. S. R., 14, p. 761); investigations concerning the self-fertility of the grape, 1900–1902 (E. S. R., 14, p. 869); a study of grape pollen (E. S. R., 14, p. 870); report of analyses of commercial fertilizers for the spring and fall of 1902 (E. S. R., 14, p. 558); inspection of feeding stuffs (E. S. R., 14, p. 790); and report of analyses of Paris green and other insecticides in 1902 (E. S. R., 14, p. 889). A reprint of a circular is noted elsewhere. An appendix contains a list of the periodicals received by the station, and meteorological observations noted elsewhere.

Fourteenth Annual Report of West Virginia Station, 1901 (*West Virginia Sta. Rpt. 1901, pp. 27*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1901; and a rather full review of the work of the station during the year, by the director.

Report on farmers' institutes—summer season, 1903 (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 10, pp. 64, figs. 2*).—This bulletin contains the following papers read at farmers' institutes during the summer of 1903: Stock Raising, Common Diseases of Farm Animals, The Cattle Tick and the Quarantine Restrictions, and Condimental Stock Foods and Condition Powders, by T. Butler; Improvement of the Soil, and The Home Garden and Orchard, by W. F. Massey; Varieties of Corn and Cotton and Their Improvement by Seed Selection, by C. B. Williams; Soil Improvement, and Fertilizer Materials and Fertilizers—Mixtures for Different Crops, by B. W. Kilgore; and Forage Crops for the Southern Farm, by C. C. Moore.

North Dakota Farmers' Institute Annual, 1903, edited by E. E. KAUFMAN (*North Dakota Farmers' Inst. Ann. 1903, pp. 192, figs. 32*).—This is made up of a large number of short articles, some of which are taken from other publications. Among the original articles mention may be made of the following: Testing Cows, by E. E. Kaufman; What the Department of Agriculture is doing for the Farmer of the Northwest, by C. B. Smith; Problems in Breeding, by W. M. Hays; Farming in North Dakota, by T. A. Overstad; The Market for Macaroni Wheat, by M. A. Carleton; Farmers' Institutes, by J. H. Worst; Varieties of Corn, and Corn Culture, by E. G. Schollander; The Care of the Corn Crop, and The Construction of Silos, by C. J. Zintheo; Eradicating the Mustard, by E. G. Schollander; Small Fruits in North Dakota, by R. S. Northrop; Some North Dakota Weeds, by L. R. Waldron; and The Underground Water Supply, by D. E. Willard.

Conditions for intensive and extensive agriculture in Germany, J. FROST (*Inaug. Diss., Univ. Berlin, 1903, pp. 91*).—This thesis treats of the relationship of climate, soil, dismemberment of estates, transportation, markets, labor, and capital to intensive and extensive agriculture in Germany.

Management of the Estate Lobositz, W. MEDINGER (*Inaug. Diss., Univ. Halle, 1902, pp. 203*).—The history of the estate is given and the climate, location, soil, and management are described. The history of the management dates back over a century.

Development of French agriculture under the present tariff system, B. FRANKE (*Inaug. Diss., Univ. Berlin, 1903, pp. 19*).—In connection with a discussion of the subject the author presents statistics with reference to production, consumption, and value of different agricultural products for a series of years. Comparative data for other countries are also given.

Agriculture in New Zealand, M. MURPHY (*New Zealand Offic. Yearbook [illegible], pp. 588–605*).—The agricultural conditions of New Zealand are spoken of with reference to the principal crops grown, and the cattle, sheep, horse, swine, and poultry industries. Many statistics are given.

Twenty-fourth annual report of the Director of the United States Geological Survey to the Secretary of the Interior, 1902-3, C. D. WALCOTT (*Ann. Rpt. U. S. Geol. Survey, 24* (*1902-3*), *pp. 302, pls. 26*).—This report explains the organization of the bureau and outlines the work of the year in its various branches.

"The Survey as now organized is divided into five branches, the geologic, topographic, hydrographic, publication, and administrative. The geologic branch includes the divisions of geology, and paleontology, of mining and mineral resources, and of physics and chemistry." The topographic branch includes divisions of topography and geography and forestry. The hydrographic branch includes "the work of the division of hydrography and also that of the reclamation service, organized to carry on the surveys and examinations authorized by the reclamation law. The proceeds of the sale of public lands in the Western States and Territories, which were set aside to create a fund for this purpose, amount to between $3,000,000 and $4,000,000 a year. . . . A division of hydrology has also been added to the hydrographic branch, the purpose of which is to study geologic conditions governing the occurrence of underground waters. Another feature of this branch is the division of hydro-economics, of which the chief raison d'être is the investigation of the quality of water and its effect on various industries."

Foreign trade in farm and forest products, 1903, G. K. HOLMES (*U. S. Dept. Agr., Bureau of Statistics Circ. 15, pp. 20*).—The total value of the imports of farm products during 1903 was $456,199,325 and of the exports, $878,479,451. The imports of the forest products amounted to $71,478,022 and the exports to $58,281,124.

Wine statistics of Switzerland, 1902 (*Landw. Jahrb. Schweiz, 17* (*1903*), *No. 9, pp. 443-541*).—This is the third report of this character, and consists of statistical data relating to the wine industry in the different cantons of Switzerland, and analyses of over 700 samples.

Accessions to the Department Library, 1903 (*U. S. Dept. Agr., Library Buls. 46, pp. 67; 47, pp. 56; 48, pp. 45; 49, pp. 64*).

NOTES.

Connecticut Storrs Station.—As previously noted (E. S. R., 15, p. 525), the station has arranged for conducting experiments in cooperation with the Bureau of Animal Industry of this Department in the making of soft cheeses. In connection with this work, Dr. Charles Thom, of Ithaca, N. Y., has been appointed mycologist; Alfred W. Bosworth, formerly of the Rhode Island Station, chemist; and E. B. von Heyne, of Waterville, N. Y., practical cheese maker.

Florida University and Station.—The recent legislature enacted a law giving the university power to investigate, segregate, or destroy domestic animals afflicted with communicable diseases. The station veterinarian was appointed for this work. Two considerable outbreaks of glanders in the State have been suppressed. Twenty-six thoroughbred Shorthorn cattle have been inoculated this winter for protection against Texas fever, with no deaths so far. The practicability of shipment of cattle direct to the owner and subsequent inoculation for fever is also being tested. Its success so far seems certain. This will relieve the owner of considerable expense attendant upon having the work done at the station itself. The old greenhouses having become unsuitable have been repaired and put in excellent condition. Cooperative experiments in the control of potato diseases have been instituted in connection with C. G. White, at Hastings, which is the largest potato-producing section of the State.

Hawaii Station.—Plans have been made for an office building and a chemical laboratory building, to be erected with funds appropriated by the Territorial legislature. The new buildings will be located on the naval hospital site adjacent to the land already occupied by the station.

Idaho University and Station.—Short courses in horticulture and dairying have been conducted at the university this season.

Kentucky College and Station.—The legislature has appropriated $15,000 annually toward the maintenance fund of the college. A bill providing $25,000 for a building for the normal department of the college passed both branches, but was vetoed by the governor on the ground of economy. The fund for the enforcement of the pure-food law has been increased from $7,500 to $10,500 annually.

Nebraska Station.—Operations have been begun on the substation at North Platte, established by the State legislature, and W. P. Snyder, assistant in animal husbandry in the station at Lincoln, has been appointed superintendent of the new substation. As previously noted, this station is located on a tract of 1,920 acres of land 3 miles south of North Platte. The tract includes 280 acres of bench land, only about 20 feet to permanent water, and already under an irrigation ditch. The balance is table-land 2,900 to 3,000 feet above sea level. About 160 acres of this is level and will be used for farming purposes, while a large portion is broken and only valuable for pasture. This pasture land is covered with buffalo grass and other excellent grasses. Most of the experiments in dry farming will be duplicated, one set being made on the bench land and one on the table-land. Experiments will also be made on the effect of dehorning steers under range conditions, a lot of 150 2-year-old cattle being equally divided, one half being dehorned and the other half allowed to run without dehorning. Experiments will also be made to determine the amount of grain which

can profitably be fed to hogs to produce the cheapest pork on alfalfa pasture; and at an early date experiments in the growing of timber for posts and for wind-breaks will be started. After wind-breaks have been established, experiments in orcharding will be undertaken.

Rhode Island Station.—A. G. Lander, B. S. A., a graduate of Cornell University, has been appointed second assistant chemist, vice A. W. Bosworth, resigned.

South Carolina College.—J. V. Lewis, professor of geology and mineralogy and of soil physics, has resigned to take effect June 8.

Tennessee University and Station.—The station is preparing an exhibit of 50 cases for the Tennessee World's Fair Commission, to be shown at St. Louis. These cases represent the various lines of work in progress at the station, and show in a graphic manner the crop-producing capacity of Tennessee soils and the relative merits of the several fertilizers for these crops, the character and variety of crops that can be produced, and the results of various feeding experiments conducted by the station. The exhibit will constitute a central feature of the general agricultural display of the State. The short courses in agriculture and dairying recently closed showed a gratifying interest in these courses. Farmers' institutes have been held in practically every county in the State during the year. These institutes have been uniformly successful and the attendance satisfactory. Preparations are now being made for the twenty-ninth annual meeting of the East Tennessee Farmers' Convention, to be held in Knoxville June 1, 2, and 3, and steps are being taken to organize a State live-stock breeders' association.

Vermont University and Station.—L. R. Jones has been given leave of absence until September and will spend the time in Europe studying potato diseases and in search for disease-resistant varieties.

Wisconsin University.—F. J. Wells, assistant professor of agricultural physics in the college of agriculture, died March 1 after a brief illness. Professor Wells was a graduate of Lawrence University, and for several years a teacher in the public schools of the State. Believing that the agricultural field offered a good opportunity for his energies he entered the college of agriculture as a graduate student, devoting his time mainly to agricultural physics and chemistry. In March, 1902, he was appointed instructor in agricultural physics and was later advanced to the position of assistant professor. His sudden death was a great shock to all of his associates. Frederic Cranefield, assistant horticulturist, has resigned to accept the secretaryship of the State Horticultural Society, with headquarters at Madison.

Wyoming University and Station.—The short course given at the university from March 1 to 12, the first attempt at a short course in the State, was most gratifying in the attendance and the interest evidenced. There were over 150 in attendance; 131 registered as students, and 73 of these were ranchmen representing 8 of the 13 counties in the State. During the first week, which was devoted to irrigation, addresses were made by Elwood Mead of this Office, L. G. Carpenter of Colorado, John E. Field of the Reclamation Service, C. T. Johnston, State engineer of Wyoming, and Judge C. N. Potter of the Wyoming supreme court, besides members of the faculty. The second week was devoted to live-stock judging and management, and the interest increased up to the last day of the course. The course has attracted wide attention throughout the State and will probably be made an annual feature. W. E. Field has been appointed head farmer, and H. C. McLallen, of the New Mexico College and Station, has been appointed general assistant in the station to have charge of the notes and records.

United States Department of Agriculture.—Fourteen horses and mules used at the Arlington Farm have died of cerebro-spinal meningitis, supposedly from eating immature, moldy corn. Within 8 days after the first appearance of the affection all the animals were dead, including all those kept at the farm.

Frederick L. Lewton, of Pennsylvania, has been appointed scientific assistant in botany, in the Bureau of Plant Industry, and entered upon his duties early in April.

Overton W. Price, assistant chief of the Bureau of Forestry, has been appointed lecturer in the Forest School of Yale University.

Association of American Agricultural Colleges and Experiment Stations.—A circular recently issued by the executive committee announces that the next annual meeting of the association will be held during the week beginning October 30, 1904. The place of meeting has not been definitely determined upon, but if satisfactory arrangements for railroad and hotel rates can be secured Des Moines, Iowa, will probably be selected.

National Farm School.—L. J. Shepard resigned his position as agriculturist of the National Farm School at Doylestown, Pa., at the close of February to accept a position in charge of a 700-acre farm in Morristown, N. J. He has been succeeded by W. H. Bishop, formerly of the Delaware College and Station. C. P. Halligan, a graduate of the Massachusetts Agricultural College and recently connected with the Arnold Arboretum, has succeeded W. B. Madison as horticulturist, who, as previously noted, has gone to the Mount Hermon School, near Northfield, Mass.

Live-stock Exhibit of the Colleges and Stations at St. Louis.—The committee on the exhibit of the colleges of agriculture and mechanic arts and experiment stations at the Louisiana Purchase Exposition has provided for the exhibition of the work with live stock and in agronomy at these institutions. This will include demonstrations of the methods of teaching and investigation and exhibits of the results of investigation, together with a daily programme of lectures and class demonstrations in stock and grain judging. The exposition authorities are expected to provide suitable quarters, consisting of a judging and demonstration pavilion, with amphitheater of ample seating capacity, and facilities for conducting slaughter and block tests and cooking trials. Exhibits of different classes of live stock have been assigned to different institutions and will show the results of different methods of feeding, the improvement of grade animals by good sires, the influence of age on cost of production, and other points of interest in this connection. A number of slaughter and block tests are planned for. This live-stock exhibit will supplement the exhibits made in the educational building, and should prove a most instructive feature as illustrating the methods which have been worked out at the colleges and stations.

County Experiment Stations.—Under this caption *Wallaces' Farmer* describes the experimental work done last year on the Sioux County, Iowa, poor farm in cooperation with the experiment station at Ames, and notes the movement of other counties to follow the example. The trials at the Sioux County farm were with varieties of corn, and were laid out and supervised by representatives of the State station. The results reported are of so much interest that the future financial support of the undertaking is assured. At least four other counties in the State will conduct experimental work on their poor farms this season. The value of these experiments to the farmers in such lines as growing seed corn acclimatized and suited to the immediate locality is pointed out, and other useful lines suggested which will make the county poor farms "practical experiment stations of the greatest value." The writer predicts that in a few years every county dominated by progressive farmers "will insist that the county poor farm be an experiment station for that county."

A Pure Seed Bill.—A bill introduced in the National House of Representatives to prevent the adulteration of blue grass, orchard grass, and clover seed, has been favorably reported, with amendments, by the Committee on Agriculture. The bill prohibits the interstate and international traffic in seed of orchard grass, Kentucky blue grass, red clover, mammoth clover, or alfalfa, which is mixed, adulterated, or misbranded; and provides a penalty of not less than $200 or more than $500 for the first offense, and from $300 to $1,000, or imprisonment not exceeding one year, for each subsequent offense. An inspection of the varieties of seed mentioned, to extend throughout the whole country, is to be made by the Bureau of Plant Industry of this

Department. Seed condemned as being mixed, adulterated, or misbranded is to be confiscated and disposed of by direction of the court. The legal conception of mixing, adulterating, and misbranding is defined in detail.

Our Future "Public Analysts."—In an article under this caption in the issue of *Science* for March 18, R. O. Brooks, of the New Jersey Laboratory of Hygiene, directs attention to the growth of public supervision of food products and standard drugs, and to the need of supplying men for this work. He points to the State experiment stations as the logical and most appropriate institutions for carrying out the technical part of the inspection, the food commissioner being mainly a prosecuting officer, and commends these institutions for that service on account of their equipment and personnel, which make research work on composition, nutritive value, etc., feasible, and the present relations of the station chemists to the Association of Official Agricultural Chemists. The need of considerable special training for this branch of service and the dearth of properly trained men to fill prospective positions are pointed out, and the colleges maintained under the land-grant and Morrill acts are thought to be especially qualified for training at least the locally needed public analysts of the future. The association of the experiment stations with these colleges is mentioned as an especial advantage. These colleges "have facilities (departments, professors, and laboratories) wherewith to give instruction in the subject of foods, their composition, nutritive and economic value, methods of adulteration and detection of the same, etc.; and in the senior year or as postgraduate assistants, give the students an opportunity to gain an insight into and a little actual experience in food investigation work, and also, if possible, in methods of rapid legal inspection work at the local experiment station, or at least from the official chemists of these stations. The preparatory subjects, which we may consider as junior year electives, would include organic chemistry and outlines of organic analytical methods (fat extractions, melting point determinations, etc.), histological botany and microscopy and physiology, especially the subjects of nutrition, digestion, and assimilation. In the senior year the really special studies would be undertaken, viz, the study of foods as previously outlined; the natural composition, nutritive and economic value, utility, methods of adulteration, etc., of foods being taught by lectures, while the methods of scientific investigation and rapid legal inspection, especially the use of the microscope and the utilization of histological botany, would be taught simultaneously in the laboratory. . . . Such a comparatively simple, wholly possible and practicable course of training, especially if supplemented with actual experience in the local experiment station, would supply a national and soon to be a pressing need for competent trained 'public analysts,' similar to those regarded necessary by the smallest and least pretentious English towns and cities."

National Diploma in Agriculture.—As many of our readers know, the National Agricultural Examination Board, representing the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland, has for several years past been issuing a national diploma in the science and practice of agriculture to candidates who successfully pass the examinations. The fifth annual examination will be held early in May at Yorkshire College, Leeds. It is interesting to note that the examination consists of two parts, which must be taken in different years, the second part being taken within two years after passing the first part. The examination in part 1 comprises agricultural botany, mensuration and land surveying, general chemistry, geology, and agricultural entomology; and in part 2 practical agriculture, agricultural bookkeeping, agricultural chemistry, agricultural engineering, and veterinary science. Candidates who obtain an average of 75 per cent in the two parts receive the diploma with honors, and a gold medal is awarded to the candidate making the highest grade.

Proposed Aberdeen Agricultural College.—The establishment of an agricultural college in Aberdeen, Scotland, has been under consideration for some time, and from

the latest reports given in *Mark Lane Express* is looked upon with favor. Last year over $5,000 was spent on agricultural education in the county, about $2,000 being given to the agricultural department of Aberdeen University and the remainder spent by the education committee on local classes. The new college would undertake the whole of the work in agricultural education, bringing about a thorough coordination of efforts in this direction, and the amount of money heretofore available would be doubled by the promised grant from the education department, which, it appears, has signified its dissatisfaction with the present arrangement. The Aberdeen County secondary education committee has appointed a subcommittee to confer with the county finance committee with reference to recommending a sum which the county might appropriate for the new college.

Forestry Exhibition at Perth.—An exhibition of objects relating to forestry in all of its branches is to be held in the show yard of the Highland and Agricultural Society at Perth, Scotland, in July, under the auspices of the Royal Scottish Arboricultural Society. Prizes are offered for collective exhibits of timber grown in Scotland, for a report on the damage done to forest trees by insect pests and the measures which have been successfully adopted for their extermination, specimens showing the comparative quality of larch timber grown on different soils and situations and the respective ages at which it reaches marketable size and maturity, examples showing the best methods of utilizing small wood in the manufacture of fancy wood articles, for a scientific instrument for expeditiously measuring the diameter of trees at a given height, and for the best exhibit of timber preserved by a practical and economical process.

Prize Competition.—The Association of Berlin Butter Dealers has offered the following prizes: (1) 3,000 marks for a method of determining palm fat in butter, (2) 1,000 marks for a method of determining palm fat in lard, and (3) 2,000 marks for a method of determining lard in butter. The methods must be capable of being carried out in a properly equipped laboratory in a day, must not cost more than 6 marks for a determination, and must be accurate in mixtures containing 15 per cent of the foreign substance. The competition is open until February 1, 1905. The address of the association is Verein Berliner Butterkaufleute, Alexander strasse 64, Berlin.

Personal Mention.—George A. Putnam has been appointed to succeed G. C. Creelman as superintendent of farmers' institutes in the Province of Ontario, Canada.

It is reported in *Science* that L. H. Bailey, of Cornell University, will superintend the nature-study courses in the summer session at the University of Tennessee.

President Andrew S. Draper, of the University of Illinois, has resigned to become commissioner of education in New York State, under the new unification bill which has recently received the governor's signature.

The death is announced of Henry Michaelson, supervisor of the Pikes Peak Forestry Reserve and a writer on matters relating to irrigation and forestry.

It is reported in *Science* that Prof. E. von Behring will succeed Prof. Robert Koch as head of the Berlin Institute for Infectious Diseases, and that the Prussian Government will take over the serum institute founded by Professor von Behring in the neighborhood of Marburg.

Prof. Ludwig Bühring, successor to Prof. M. Maercker as director of the Halle Agricultural Chemical Control Station, died suddenly February 15 at the age of 58.

Dr. F. W. Dafert, director of the Agricultural Chemical Experiment Station of Vienna, has been called by the Austrian ministry of agriculture to the position of director of the department of agricultural experiment stations. Prof. Johann Wolfbauer has been appointed acting director of the Vienna Station.

Miscellaneous.—The bill before the New York legislature to appropriate $250,000 for buildings and equipment for the College of Agriculture at Cornell University continues to meet with considerable opposition, in which the presidents of six or seven

other universities and colleges in the State are very active. A bill introduced some weeks ago appropriating $200,000 to establish a State college of agriculture at Cobleskill has been advocated by the opposition, and also naturally by the people in the region of Cobleskill, prominent among whom was the president of Union College. The chancellor of Syracuse University is reported as having taken a leading part in this opposition, advocating first a division of the Federal funds among the colleges of the State, and more recently the appointment of a commission. In an address before the finance committee of the senate, the chancellor made grave charges against Cornell University, and this address was published in a pamphlet entitled "A Protest and Some Other Proposals Concerning Agricultural Education," which has been widely circulated, followed by a second set of charges. This agitation has called forth a twenty-four page circular on Agricultural Education in New York State, by Prof. L. H. Bailey, in which he answers the charges against the university, and maintains that agricultural education in the State can best be provided for at the institution where large provision in teaching force and equipment already exists. The Cornell bill has passed the assembly and early action in the senate is expected.

The Cornell Countryman notes that out of 43 students in the general winter course in agriculture at Cornell, 30 chose poultry husbandry for their elective course. This is gratifying evidence of the interest taken by students in this new department.

From the same source we note that at the meeting of the New York State Grange, early in February, it was voted to establish four grange scholarships in the college of agriculture at Cornell University, which contributes a distinctly new feature to the educational movement in the State.

The Forest School of Yale University has received, by gift of G. H. Myers, the library of the late Robert Henry, of Munich, containing about 1,500 books and pamphlets on forestry.

Announcement is made that at the fifth summer session of Columbia University provision will be made for instruction in foods and human nutrition. A course of five lectures a week on the chemistry of food and nutrition, with collateral reading and with or without laboratory work, is offered by Dr. H. C. Sherman; and Prof. H. T. Vulté, of the department of domestic science, will give courses on food principles and on food production and manufacture. The course on food principles will include sugars, starches, proteids, fats, etc., with special attention to the changes taking place during domestic manipulation and digestion. The course in food production and manufacture will cover such matters as the milling of cereals, composition and use of leavening agents, jellies and preserves, oils and fatty bodies, and water for drinking and detergent use. Courses in the theory and practice of teaching nature study in elementary schools, consisting of lectures, readings, discussions, and practical work, and in biological nature study, including lectures, readings, and work in the laboratory and the field, will be conducted by Prof. M. A. Bigelow and Miss Ada Watterson, of the department of nature study. The school opens July 6 and will continue until August 17.

The Cyprus Journal is the title of a new agricultural periodical published at Nicosia, Island of Cyprus, under government auspices. It is printed in three languages—English, Greek, and Turkish, the first two being in parallel columns and the Turkish in a separate part. From the first number of this journal we learn that the government has lately purchased a farm at Athalassa, near Nicosia, for the purpose of establishing a "model and experimental farm." In addition to culture and fertilizer experiments, and demonstrations of the use of modern agricultural implements, attention will also be paid to improving the quality of the native breeds of cattle. Other lines of effort for the promotion of agriculture, which are carried on by the government, are the maintenance of a nursery and experimental grounds, the distribution gratis or by sale at low prices of various kinds of plants, and the introduction of agricultural implements and machinery and their sale at greatly reduced

price on easy terms of payment. Expensive irrigation works have been constructed in recent years from which much permanent good is anticipated; money has been advanced by the loan commissioners for waterworks and other objects of public utility, and effective measures have been taken to improve the breed of the larger island cattle.

A recent number of *Gardening* states that a school for the training and instruction of women in practical horticulture has been established at Godesberg, on the Rhine.

According to statistics for the present academic year, of the 37,813 students matriculated at the 21 universities of the German Empire, 35,082 are German and 2,731, or 7.2 per cent of the total number, are foreigners, of whom 276 are Americans. Of the foreigners 199 are students of forestry and 146 of agriculture.

The Sixth International Zoological Congress will be held at Berne, Switzerland, August 14 to 19, 1904.

A departmental committee has been appointed to inquire into the workings of the British fertilizers and feeding-stuffs act of 1893. The committee is now engaged in taking testimony on this subject.

The directors of the Highland and Agricultural Society have under advisement the inauguration of a series of agricultural motor implement trials, with substantial prizes to encourage the perfection of this class of machinery.

It is reported in *Oesterreichische Chemiker-Zeitung* that the younger potash establishments of Germany are planning an independent combination, with headquarters either at Hamburg or Berlin, repeated efforts of the minister of commerce having failed to secure them concessions from the older organization.

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EXPERIMENT STATION RECORD.

VOL. XV. MAY, 1904. No. 9.

The bill making appropriation for the National Department of Agriculture was passed by Congress April 23. It carries a total appropriation of $5,902,040, an increase of $423,940, which, while it is somewhat less than the annual increase for several years past, will provide for a continued steady growth of the Department. The above comparison does not take account of the emergency appropriation made last year for eradicating foot-and-mouth disease, a portion of which, amounting to a quarter of a million dollars, was made available earlier in the session for combating the cotton-boll weevil. The increase for the coming year is not as generally distributed throughout the Department as it has been in some years, about nine-tenths of the increase being for the Weather Bureau and the Bureaus of Animal Industry, Forestry, Plant Industry, and Chemistry, in the order named.

The Weather Bureau receives $1,337,740, an increase of about $89,000, which applies mainly to salaries and general operating expenses. The Bureau of Animal Industry is given $50,000 additional for its inspection and investigation work, and $25,000 for experiments in animal breeding and feeding in cooperation with the State experiment stations. Its total for next year is $1,362,880. The Bureau of Plant Industry, which has grown rapidly since its organization, receives a relatively large increase—$69,500—distributed quite generally among its different lines of work, and making a total of $744,430. The first appropriation for this Bureau after its organization four years ago was $231,680, exclusive of the $250,000 for seeds, which is now assigned to it. Its appropriation for investigation—i. e., exclusive of the seed fund—has therefore considerably more than doubled in the past four years. In addition to its regular appropriation, the Bureau will this year receive quite a share of the emergency appropriation for combating the cotton-boll weevil. For investigations in vegetable pathology and physiology there is an increase of $20,000 and provision for erecting a greenhouse; and for work in pomology, out of a total of $43,500, a new provision allows the expenditure of $10,000 in cooperation with the California Station, for determining the adaptability of various grape stocks to the different soil and climatic conditions of the Pacific Coast, and their resistance to disease. The

allowance permitted for seed and plant introduction from the general seed fund is increased to $40,000 (formerly $30,000); and provision is made for an inspection of grass, clover, and alfalfa seed, the results to be published with the names of the parties offering the seed for sale. The clause relating to investigation on domestic sugar production provides for developing the growing of sugar-beet seed in this country and demonstration of the superiority of high-grade seed and of methods of increasing the tonnage of sugar beets. Twenty-five thousand dollars is provided for moving the greenhouses adjacent to the Department building in order to accommodate the new building.

The appropriation for the Bureau of Forestry is $425,140, an increase of $75,140; for the Bureau of Soils, $214,680, the only increase being for the salaries of two draftsmen; and for the Bureau of Chemistry, $149,800. The latter is an increase of $64,500 and carries as a new item $15,000 for the chemical and physical examination of road materials, formerly conducted with the cooperation of the Office of Public Road Inquiries. The appropriation for studies on table sirup is continued, with provision for a report at the next session of Congress; and starch-producing plants are added to the list of industrial plants and products to be studied. The increase for the Bureau of Chemistry is much the largest it has received since it became a bureau.

The former Division of Foreign Markets is incorporated in the Bureau of Statistics, which receives an additional appropriation of $24,600, aside from that for the above Division, making its total $197,260. The Division of Entomology is raised to the grade of a bureau, and the scope of its work broadened to include "investigations of insects in relation to diseases of men and domestic animals, and as animal parasites." In other respects its lines are more specifically enumerated than formerly, covering all phases of economic entomology and related investigation. Its total appropriation of $82,450 is a slight increase over the present year.

The new appropriation gives this Office, as before, $40,000 for the general expenses of the Office proper, $15,000 each for the experiment stations in Alaska, Hawaii, and Porto Rico, $5,000 for farmers' institutes, $20,000 for nutrition investigations, and $67,500 for irrigation investigations, which are extended to include drainage, an increase of $2,500 in the latter case. This makes a total of $177,500 for the Office and the various lines of work assigned to it. In its internal organization and the scope of its work the Office is in effect a bureau, and has long since outgrown the title of "office" as at present used in the Department organization.

For the Biological Survey $51,850 is appropriated, the same as last year; for Road Inquiries, $35,000, also the same; for the Library, $20,200; and for the Division of Publications, $240,640, an increase of

$11,320. The latter appropriation carries the allowance for Farmers' Bulletins, but as usual does not include the fund available for printing the other miscellaneous bulletins of the Department. The allowance for this purpose out of the general printing fund is $185,000, including $25,000 set aside for the Weather Bureau. Aside from this, $300,000 is provided for the Department Yearbook; and the annual reports of the Bureau of Animal Industry, the Weather Bureau, the Soil Survey, and this Office, together with other special reports ordered by Congress, are provided for specifically. All told, the expenditures for Department printing make the imposing aggregate of nearly or quite $850,000 a year.

The great need of adequate buildings to provide office and laboratory accommodations suited to the needs of this large and growing Department is emphasized by the rent item which the new act carries. This amounts to about $37,000, a considerable increase over last year. While the total amount may not be required, the annual rental on most of the buildings is a fixed charge, and the temporary quarters required fitting up and special equipment, much of which is of no permanent value. Plans for the new building are well in hand, and now that the location has been definitely decided upon the details will be prepared as promptly as possible. The location selected is immediately in rear of the present building and back of the line of the boulevard extending from the Capitol to the Washington Monument.

The new appropriation act illustrates in a striking manner how intimately the work of the Department and the experiment stations is associated in the mind of Congress.

The clause relating to the work of the latter, which was inserted by the House committee, was subsequently stricken out, and the wording of the appropriation for the stations as finally passed remains unchanged.

The stations are mentioned in the bill no less than fifteen times, outside of the clause making specific appropriation for them. These references provide for the cooperation of the Department with the stations in extending its work, and place the aid of the Department at the disposal of the stations in other ways. For example, the appropriations for inaugurating experiments in animal breeding and feeding, for continuing the work of plant breeding and selection, for testing plant introductions, for studying the influence of environment upon the composition of cereals, sugar and starch-producing plants, for determining the adaptability for grape stocks, for studying market conditions affecting the fruit and vegetable trade, for grass and forage plant investigations, for drainage and irrigation investigations, and for studies on human food and nutrition, all make specific mention of the experiment stations as cooperating

agencies; and, on the other hand, directions are given for furnishing duplicates of models of fruits and vegetables to the stations as far as practicable, for standardizing the naming of varieties of cereals as a basis for the work of the stations, for making the results of work in tropical agriculture available to the work of the stations, for aiding in disseminating the results of the stations' work by farmers' institutes, and for assisting the agricultural colleges and experiment stations in disseminating information on road building.

The increasing need of larger funds for the stations is emphasized by the rapidly increasing funds of the Department for its work in various lines, and the frequent inability of the stations with their present funds to cooperate with the Department in extending its work in their States.

The interests of the Department and the experiment stations are bound together by a common cause and a unity of purpose, which places them in a position of reciprocal helpfulness. That this is appreciated by Congress is evidenced by the wording of the appropriation act, which suggests a closer bond of union than is indicated by the Hatch Act.

The establishment of a central experiment station in Cuba marks the beginning of agricultural investigation in that island. Thus far practically nothing has been done in the line of experimentation in any branch of agriculture, and the conditions are in many respects exceedingly primitive. The modern methods of agriculture as related to animal production, crop production, and soil fertility are practically unknown, and very little has been published regarding the plant diseases of Cuba, which are numerous and troublesome. The movement to establish systematic experiments and investigation has come as the result of a real need and of faith in the methods which have been productive of such far-reaching results in this and other countries.

The new station is located at Santiago de las Vegas, in Havana Province, about twelve miles from the city of Havana. It is under the general supervision of the secretary of public works, who is now also acting secretary of agriculture, the secretary of agriculture appointed when the department was established a few years ago having resigned. The director of the station is Prof. F. S. Earle, late of the New York Botanic Gardens, who has been associated with the work of the Bureau of Plant Industry of this Department, and the experiment stations in Mississippi and Alabama. Professor Earle brings to his work exceptional fitness for the direction of agricultural investigation in the tropics, and a thorough knowledge of the methods of the experiment stations of this country.

The station is located on a tract of 180 acres of land which is old and worn, but in many respects is typical in character. The place was originally a Spanish barracks, and has a large stone building with

about 40,000 sq. ft. of floor space, and several stables and other buildings. These can be readily adapted to the needs of the station and will save the expense and time of building. General Wood established an industrial school for orphan boys upon this farm, with the plan to make practical instruction in agriculture a prominent feature. About 300 boys were in the school when it was moved into Havana, and some experimental work with sugar cane had been commenced.

The station starts out with a liberal appropriation of $75,000 a year, and a good prospect for continuance, as there is much interest in the new undertaking. Six departments are planned for: (1) Agriculture, (2) animal industry, including veterinary science, (3) horticulture, (4) chemistry and soil physics, (5) botany, and (6) plant pathology, including entomology. The agricultural department is the only one organized at present. It is in charge of Francisco Cruz, a native Cuban, who is an expert in tobacco culture and well informed in other lines of agriculture. Mr. Cruz had been at the head of one of the provincial departments of agriculture, where he had started some promising lines of investigation.

The new station is spoken of as a central station, in the expectation that it will be the beginning of an experiment station system, the exact nature of which has not yet been determined upon. This may take the form of branch stations affiliated with the central station, or cooperative work carried out on private farms.

The field is a virgin one for investigation, and opportunities for useful lines of work present themselves on every hand. Cuba is thought to be one of the best cattle countries in the world, having magnificent pastures and abundant forage crops. There are only a few blooded animals in the island, however, and there is great opportunity for improvement in breeding and management. Dairying as an industry is practically unknown, and there is thought to be a fine opportunity for its development.

In tobacco culture, for which the island is famous, there is said to have been no systematic work in seed selection, and the methods of tobacco raising now practiced offer many opportunities for improvement. Although large quantities of fertilizers are often applied in farming, this is not done in an intelligent manner or with reference to supplying definite elements of plant food, and very little attention is given to other means of conserving or improving soil fertility.

Practically nothing has been done toward the development of agricultural education in Cuba as yet. The University of Havana has a department of agriculture, but this is evidently not very active or influential at present. The industrial school formerly located on the site of the station is the only attempt made to start an agricultural school, and as the agricultural feature has now been abandoned, the people are practically without facilities for instruction in agriculture.

The establishment of the experiment station on a liberal basis, and

the determination to secure a thoroughly competent director and corps of workers, is an evidence that the authorities have awakened to the needs and the opportunities for developing the great productive industry of the island and placing it upon a more rational and progressive basis. The development of the station under Director Earle will be followed with much interest by his many friends in this country.

The inauguration exercises of the new agricultural course at Mount Hermon School for Boys, near Northfield, took place April 18. The occasion was the annual commencement of the school, and the exercises served to give formal recognition and prominence to this new course, which was started last fall.

The principal address was made by Prof. L. H. Bailey, who spoke upon the place of agricultural instruction in the college and school curriculum. His remarks showed the steady growth of interest in the teaching of agriculture, the various forms which this is now taking, and the more general recognition accorded to it for its educational value and its utility as a preparation for daily life.

While the Mount Hermon agricultural course is in a sense an experiment, it is one in which the friends of agricultural education have great faith. The conditions afforded at the school for developing such a course seem in many respects ideal. A farm of a thousand acres is already at hand; the Northfield schools furnish a large market for its products; over 400 boys are in attendance, who are required to do a stipulated amount of manual labor every day about the college buildings or on the farm; and many of the boys come from country districts, with a desire to learn something which will be of direct advantage to them when they return to their homes. It only remains to make the labor required of the boys instructive and attractive, to systematize it, and to combine with it theoretical instruction which will teach the reason for the methods practiced.

It will require money to develop the new department, but under the old system the farm has been a source of considerable expense, and the saving which is being effected in the operating expenses and the increased returns from the improved system of farming will in part provide the necessary means. And in the past it has not been the rule at the Moody schools that new developments have been checked by lack of funds; a way has been found for providing means after the wisdom of the undertaking has become manifest.

In the death of Hon. Levi Stockbridge, of Massachusetts, a familiar landmark in the field of agricultural education has passed away. For nearly a quarter of a century he was a prominent and influential figure in the development of the Massachusetts Agricultural College, and in securing for it the recognition and financial support of the State. He was identified with the college from its inception, urging upon the

legislature the acceptance of the Federal land grant of 1862, assuming charge of the college property in 1866, and upon the opening of the college the following year becoming its first professor of agriculture one of the very few in the land at the time. He occupied that chair without interruption until 1882, and again in 1888–89, serving twice in the meantime as acting president. He was president of the college from 1880 to 1882.

It was no fault of his that those years included some of the darkest in the history of the college. It was rather the unreadiness of the times. Opposition was strong, often bitter, and the public mind was hardly prepared for this new kind of education. It is to the credit of the institution that it held its place as a distinctly agricultural college, and gradually gained recognition for its work and a public sentiment to bear it up. His strength and vigor and perseverance counted for much in those trying times.

Professor Stockbridge lived to see the teaching of agriculture gradually assume pedagogic form, many of the old ideas supplanted, and the subject so developed and specialized that instead of a single professor of agriculture a corps of specially trained men are required at the leading institutions; but the service which he and others of his type rendered in preparing the way for this development was of untold value and was fundamental in the evolution of this new branch of instruction.

As he was a leading spirit in the establishment of the agricultural college, so he was one of the prime movers for the experiment station. With Goessmann and Clark he conducted field and laboratory experiments which attracted wide interest and helped to show the practical value of experimental work to the farmer. The claims which he made in his urgent appeals for the experiment station have been more than justified with the passage of years; and the national growth and influence of the stations in this country, which probably surpass anything pictured by his keen and far-seeing imagination, is but another indication of the progressive times in which we live.

His was an active, earnest, useful life in the public service of agriculture. We glory in his having lived to see its advancement in so many directions. All honor to those pioneers like himself, who, with courage and perseverance born of their convictions, fought out the battles of our agricultural institutions in the darker days of their history, and paved the way for their present success and prosperity.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The direct determination of potassium in the ash of plants, E. M. EAST (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 297–300*).—In the method proposed 2 to 3 gm. of substance is incinerated with ammonium nitrate, and the determination of potash in the ash thus obtained proceeds as follows:

"Transfer to a beaker with only a few drops of hydrochloric acid and heat to boiling. Add to the hot solution barium hydroxid solution saturated at 32°, sufficient to precipitate interfering salts. From 3 to 5 cc. are usually enough, providing the hydrochloric acid has been used sparingly. Digest one hour, filter hot, and wash with hot water. Precipitate the barium as sulphate by a sodium sulphate solution made up of strength equivalent to the barium hydroxid solution used. Digest 5 hours, filter, and wash. Evaporate down to about 25 cc. in a platinum dish. Add a drop or two of hydrochloric acid and the calculated amount of chlorplatinic acid needed to convert all the alkalis into chlorplatinates. Proceed as in the Lindo-Gladding method for fertilizers. Transfer all the double salt to the filter after the first addition of 10 cc. of the ammonium chlorid solution. The interfering salts of magnesium and calcium will all be dissolved on the first application. After transferring, 5 washings of 5 cc. each are sufficient to clear the double salt from impurities; then wash with alcohol, dry, and wash through the filter with hot water as usual."

A method for the direct determination of alumina, C. E. RUEGER (*Engineer and Min. Jour., 77 (1904), No. 9, pp. 357–359*).—A modification of Wöhler's method, in which alumina is precipitated from a slightly acid solution by means of sulphur dioxid, is described.

Eudiometric and gravimetric methods of determining ammonia, E. RIEGLER (*Ztschr. Analyt. Chem., 42 (1903), p. 677; abs. in Chem. Ztg., 28 (1904), No. 9, Repert. No. 2, p. 21*).—Methods based upon the fact that ammonia or ammonium salts when acted upon in alcoholic solution by an excess of iodic acid form ammonium triiodate $(NH_4)H_2(I_3O_9)$, which yields nitrogen when subjected to the action of hydrazin sulphate, are described. The nitrogen gas may be collected and measured in a Knop-Wagner azotometer, or the precipitated ammonium triiodate may be collected on a filter, dried, and weighed. The weight thus obtained multiplied by 0.0314 gives ammonia.

On the determination of nitrites in the absence of air, J. K. PHELPS (*Ztschr. Anorgan. Chem., 38 (1904), No. 1, pp. 113–116; abs. in Chem. Ztg., 28 (1904), No. 13, Repert. No. 3, p. 35*).—The author describes the apparatus used and methods followed in making this determination in an atmosphere of carbon dioxid.

The determination of total carbon in coal and soil, S. W. PARR (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 294–297, fig. 1*).—Combustion of the substance is effected by means of sodium peroxid in a calorimeter by a method previously described by the author.[a] The resulting sodium carbonate after being boiled to free it from peroxid and oxygen is decomposed by sulphuric acid and the carbon dioxid evolved collected and measured in an eudiometer of special design, which is described

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[a] Jour. Amer. Chem. Soc., 22 (1900), No. 10, pp. 646–652.

The fixation of atmospheric nitrogen, especially by means of electricity, F. von Lepel (*Die Bindung des atmosphärischen Stickstoffes insbesondere durch elektrische Entladungen. Greifswald: J. Abel, 1903, pp. 42*).—A review of recent progress in the investigation of various bacteriological, chemical, and electrical methods which have been proposed for the fixation of atmospheric nitrogen, especial attention being given to the method used by the Atmospheric Products Company of Niagara Falls (E. S. R., 14, p. 119), by Muthmann and Hofer,[a] and by the author (E. S. R., 15, p. 551) for causing the combination of the oxygen and nitrogen of the air by means of electrical discharges. The author claims that the efficiency of the process has been greatly increased and the expense lessened, the cost of preparing a kilogram of nitric acid by his method having been reduced to 13 pfennigs (about 1.5 cts. per pound), with a cost of 2 pfennigs (½ ct.) per horsepower per hour. The cost depends entirely upon the cheapness of the electric power.

Recent experiments on the fixation of atmospheric nitrogen by means of electrical discharges, F. von Lepel (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 8, pp. 46, 47*).—A brief explanation of methods followed in oxidizing the nitrogen of the air by means of electricity.

The determination of hygroscopicity, H. Rodewald and A. Mitscherlich (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 433–441, fig. 1*).—Hygroscopicity is determined by exposing dry or air-dry samples in shallow dishes over 10 per cent sulphuric acid in a vacuum until moisture equilibrium is secured and then determining the moisture taken up by Mitscherlich's method (E. S. R., 14, p. 127). Results of tests of this method on a variety of substances, including starches, soils, etc., are reported.

Results of investigations at the Sugar Experiment Station laboratory for 1903, C. A. Browne, Jr. (*Louisiana Planter, 32 (1904), No. 3, pp. 4751*).—In this paper, which was read before the Louisiana Sugar Planters' Association, the author summarizes some of the results of the investigations of the laboratory upon the chemistry of sugar cane and its products.

In studying the insoluble carbohydrates of the sugar cane, xylan, araban, and galactan were separated and identified. Araban was present in considerable quantities, and is noted as not hitherto reported in sugar cane. Pentosans prepared from sugar cane consisted of about 4 parts of xylose and 1 part of arabinose. Galactan was found only in small amounts, constituting in one instance only about 0.07 per cent of the whole cane. In normal cane juice the different gums did not usually exceed 0.2 per cent.

Analyses were made of the pith, fibrovascular bundles, and rind of sugar cane in a study of the utilization of bagasse for paper making. A process recently patented for the separation of the pith from the rest of the fiber and the manufacture of paper from this product, is noted.

Further studies (see E. S. R., 15, p. 285), upon the enzyms of sugar cane—namely, a diastase, an invertase, an oxidase, and a reductase or catalase, are briefly noted. It is believed that oxidizing enzyms, in addition to whatever part they may play in the vital processes of the plant, may serve also as a means of protecting the plant from invasion by fungi and bacteria.

Analyses are given of the juices from different parts of an immature cane, and from whole cane at different periods of growth. The juice from the green tops of the cane cut late in the evening had nearly twice as much sucrose as the tops of the cane cut early in the morning. During the past season canes with exceptionally high sucrose and low glucose content were observed.

Notes are given on the different fermentations of cane juice which have been observed. Different methods of extraction were compared, the composition of the

[a] Prometheus, 1902, No. 3, p. 145.

juices being determined. The methods included dry extraction, steam saturation, and saturation with cold water. In experiments in clarifying juices tests were made of the gelatinous hydrates obtained from the rare mineral monazite. The results were considered no better than those obtained by hydrated alumina, which is noted as having long been discarded as a clarifying agent in sugar manufacture. The electrical method of clarification was also tested.

Dry defecation in optical sugar analysis, W. D. HORNE (*Jour. Amer. Chem. Soc., 26 (1904), No. 2, pp. 186–192*).—In order to avoid the error due to the volume of the precipitate formed in clarifying sugar solutions with subacetate of lead, the author dissolves the normal weight of sugar in exactly 100 cc. of water and adds powdered anhydrous lead subacetate. Comparative tests of this method with the ordinary method are reported. "The dry defecation method has been employed for several months in 2 sugar refineries with perfectly satisfactory results and with the added advantages of greater speed of work, the elimination of volume measurements, and the simplification of calculations."

The hydrolysis of maltose and of dextrin by dilute acids and the determination of starch, W. A. NOYES ET AL. (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 266–280*).—Studies were made of the rate of hydrolysis of maltose and dextrin under the conditions which obtain in the determination of starch by the method in common use. Several series of experiments are reported. After following the law of normal mass reaction approximately for a short time, the rate of hydrolysis became much retarded. The hydrolysis was apparently more nearly complete in a 2 or 4 per cent solution of hydrochloric acid than in a 0.5 per cent solution. A temperature of 111° C. was believed to possess a slight advantage over a temperature of 100°. The rate of hydrolysis for dextrin was about one-half of that for maltose. The reducing power of the products obtained by the action of extract of malt upon starch indicated a composition of 74 to 78 per cent of maltose and 22 to 26 per cent of dextrin.

"For the determination of starch we would recommend that, after filtration, 10 per cent by volume of hydrochloric acid (sp. gr. 1.125) should be added to the solution resulting from the action of extract of malt on the material under examination. After heating for 1 hour in a flask immersed in a boiling-water bath, making allowance for the time required for the solution to attain the temperature of the bath, the solution is cooled, enough sodium hydroxid is added to neutralize 90 per cent of the hydrochloric acid used, the solution made up to a definite volume, filtered on a dry filter if necessary, and the reducing power determined by Fehling's solution. One hundred parts of glucose found in this manner represent 93 parts of starch in the original material. The chemist should determine for himself, with pure glucose, the ratio between glucose and copper oxid or copper for the solutions and method which he uses."

Concerning the hydrolysis of cellulose with sulphurous acid, F. ZIMMER (*Mitt. Landw. Inst. K. Univ. Breslau, 2 (1902), No. 1, pp. 245–247*).—In view of the fact that alcohol is manufactured from sugar obtained from sawdust by treatment with sulphurous acid, the author studied the chemical action involved and found that the amount of sugar formed was directly dependent upon the concentration of the acid, the limit of sugar formation being 15 per cent. In making the calculations sugar was estimated as dextrose, but it was found to contain 8.56 per cent pentosan.

Investigation of the bodies called fiber and carbohydrates in feeding stuffs, with a tentative determination of the components of each, P. SCHWEITZER (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 252–262*).—The crude fiber and nitrogen-free extract in a number of samples of feeding stuffs were determined by official methods, and the individual carbohydrates making up the total carbohydrate group were also determined by special methods which are very briefly

described. The values obtained are shown in the following table, calculated to an ash-free and a water-free basis:

Carbohydrates in a number of feeding stuffs (ash-free and water-free basis).

Feeding stuff.	Total carbohydrates.	Pure fiber.	Fibropentosan.	Pectose.	Pectopentosan.	Pentosan.	Sugar.	Starch.	Indefinite carbohydrates.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Cornstalks, just before blooming	87.69	24.40	3.74	7.55	7.26	12.13	20.69	....	11.92
Cornstalks, seed in dough	95.09	31.14	5.43	5.09	6.04	15.78	2.31	1.42	27.88
Corn blades, just before blooming	72.94	18.92	3.79	8.85	7.44	12.16		21.78	
Corn blades, seed in dough	84.82	20.49	3.53	6.73	7.74	13.83	3.20	2.02	27.28
Timothy, just heading	87.58	30.08	4.56	9.49	8.18	4.72	2.91	9.24	18.40
Timothy, coming into bloom	88.23	32.75	4.87	6.29	7.14	11.14	3.16	6.12	16.76
Timothy, seed ripe	93.20	32.29	5.79	.47	6.55	12.89	3.82	6.19	25.20
Red clover, in bloom	74.54	22.34	3.00	3.08	2.11	8.95	3.86	12.01	19.19
Red clover, seed ripe	82.47	28.04	4.11	4.90	4.85	7.65	4.58	4.84	23.50
Blue grass, seed ripe	88.69	31.92	4.86	5.28	8.52	10.52	3.45	6.34	17.80

The determination of gliadin in wheat flour by means of the polariscope, H. SNYDER (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 263–266*).—Briefly described, the proposed method for the determination of gliadin by means of the polariscope is as follows:

A weighed quantity of flour (15.97 gm.) is treated with 100 cc. of 70 per cent alcohol for 12 to 18 hours at a temperature of about 20° C., the flask being shaken moderately at intervals of one-half hour for the first 2 or 3 hours. The alcoholic solution is then filtered and polarized, using a 220 mm. tube. The reading on the sugar scale multiplied by 0.2 gives approximately the percentage of gliadin nitrogen. By shaking the solution mechanically and clarifying by means of a centrifugal machine, the time of extraction may be lessened. Excessive shaking gives cloudy filtrates which can not be polarized. This trouble is also observed if the alcoholic solutions are kept too long. According to the author some flours, particularly those from soft wheat, frequently give cloudy filtrates.

"The interpretation of results, particularly as to the amount of gliadin which a sample of flour shall contain for good bread-making purposes, is a separate feature of the problem of testing wheat and flour for commercial purposes. As yet only a limited number of gliadin determinations are available, and only tentative standards are possible. In general it can be said that flour of good quality should contain 12 per cent of total proteids (N×6.25), or about 11 per cent protein (N×5.7), and that from 55 to 65 per cent should be in the form of gliadin."

The precipitation of proteids by alcohol and certain other reagents, M. CHRISTINE TEBB (*Jour. Physiol., 30 (1903), No. 1, pp. 25–38*).—The precipitation of proteids of blood, egg white, muscle, and milk by alcohol was studied, as well as the precipitating action of ether, nitric, and hydrochloric acids. Some of the author's conclusions follow:

"It has been known for some time that serum globulin is composed of at least 2 proteids, one insoluble in water (euglobulin) and the other soluble in water (pseudoglobulin). The same is true of egg globulin.

"The true globulins (euglobulin) of serum and of egg white require considerably less alcohol to precipitate them than do the albumins.

"Although the pseudoglobulins are more readily salted out from their solutions than are the albumins and less readily than the euglobulins, the precipitability by alcohol does not run quite parallel to this. . . .

"The results obtained with the proteids of milk are a little unexpected; lactalbumin is precipitable by alcohol with difficulty, but caseinogen, which one would anticipate

to fall into line with the true globulins, requires also a considerable amount of alcohol to precipitate it all; most, however, is thrown out of solution by a comparatively small amount of alcohol.

"The two principal proteids of muscle are paramyosinogen and myosinogen. Both (and especially the first named) are readily salted out from their solutions, but v. Fürth pointed out that myosinogen is soluble in water and therefore not a typical globulin. Paramyosinogen appears to be the euglobulin of muscle, it is readily precipitable by alcohol; myosinogen, the pseudoglobulin, requires much more alcohol to precipitate it entirely. . . .

"Remembering the difference in salt precipitation and alcohol precipitation which obtain between the colloid carbohydrates, dextrins, and crystalline carbohydrates, the view is supported that the true globulins have larger molecules than the pseudoglobulins and albumins.

"The prolonged action of alcohol renders proteids insoluble. The euglobulins are most readily rendered insoluble, the pseudoglobulins and caseinogen come next, while of the proteids investigated, albumins are the most difficult to convert into insoluble modifications by alcohol. It was previously well known that proteids of still smaller molecular size (proteoses and peptones) not only require a large amount of alcohol to precipitate them entirely, but also are not rendered insoluble by prolonged contact with that reagent."

The results of biological studies of proteids and the use of such data in legal chemistry and the chemistry of food, A. PARTHEIL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 20, pp. 923–927*).—A paper with discussion, summarizing bacteriological studies of blood, presented at a meeting of the Association of German Food Chemists. Some recent work was especially considered which has to do with the identification of blood by the method depending upon the fact that the blood of a rabbit inoculated with the blood serum of any given animal acquires the property of forming a precipitate with such serum.

Some experiments on biochemical synthesis, S. B. SCHRYVER (*Jour. Physiol., 30 (1904), No. 5–6, Proc. Physiol. Soc., 1903, pp. XLIV–XLVIII*).—Experiments with bases isolated from ox pancreas and bases from the liver led to the conclusion that bases from the organs play no part in condensation processes in the body.

A new method for the determination of cocoanut oil in butter, E. POLENSKE (*Arb. K. Gesundheitsamte, 20 (1904), No. 3, pp. 545–558, fig. 1; Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 273–280, fig. 1*).—In the determination of the Reichert-Meissl number insoluble fatty acids go over in part into the distillate with the soluble volatile acids. In the method described the insoluble acids in the distillate are separated by filtration, washed, dissolved in alcohol, and determined by titration with decinormal barium hydroxid, the number of cubic centimeters required for neutralization being designated a "new butter number." The Reichert-Meissl number is determined as usual in the filtrate.

The "new butter number" was found to bear a definite relation to the Reichert-Meissl number. Thirty-one samples of butter gave Reichert-Meissl numbers varying from 23.3 to 30.1, and "new butter numbers" varying from 1.5 to 3. Four samples of cocoanut oil gave Reichert-Meissl numbers of 6.8 to 7.7 and "new butter numbers" of 16.8 to 17.8. The addition of 10 per cent of cocoanut oil to pure butter fat increased the "new butter number" on an average about 1, the addition of 15 per cent about 1.6, and the addition of 20 per cent about 2.1, showing an increase in the "new butter number" of about 0.1 for each addition of 1 per cent of cocoanut oil within these limits. From the determinations of both the Reichert-Meissl number and the "new butter number" the amount of cocoanut oil in a sample of butter can be estimated approximately. Tables are given for this purpose.

A new method for the determination of the adulteration of butter by cocoanut oil and its different commercial forms, A. MÜNTZ and H. COUDON (*Ann. Sci.

Agron., 2. ser., 1904, I, No. 1, pp. 1–29, fig. 1).—A method for the determination of the water soluble and the insoluble volatile fatty acids is described in detail, and results obtained by the method on 40 samples of pure butter of different origin, 4 samples of cocoanut oil, 1 sample of oleomargarine, and various mixtures of butter and cocoanut oil are reported.

By this method the content of insoluble volatile fatty acids in the butter examined averaged 0.65 per cent as butyric acid, in cocoanut oil about 3.5, and in margarine 0.16 per cent. The proportion of the soluble to the insoluble acids in pure butter was 1:0.10 to 0.15, and in cocoanut oil 1:2.50 to 2.80. A sample of pure butter showed 5.34 per cent of soluble and 0.69 per cent insoluble acids, the ratio being 1:0.129; while the same butter adulterated with 10 per cent of cocoanut oil showed 4.90 per cent of soluble and 1.01 per cent of insoluble acids, the ratio being 1:0.206. The application of the method to the examination of adulterated butter is illustrated by numerous examples.

Some rare fixed oils, G. R. PANCOAST and W. GRAHAM (*Amer. Jour. Pharm., 76 (1904), No. 2, pp. 70, 71*).—The author classifies a number of fixed oils of limited importance commercially, and gives determinations of the specific gravity, acid number, and saponification number of several of these.

Examination of commercial peppers, J. W. GLADHILL (*Amer. Jour. Pharm., 76 (1904), No. 2, pp. 71–81*).—Determinations of ash, ether extract, piperin, and oleoresin were made on samples of 9 kinds of black pepper and 4 kinds of white pepper, the different peppers being described and the results discussed. The highest amount of ash found was 5.5 per cent for black pepper and 2.8 per cent for white pepper. In only one case did the ether extract exceed 9 per cent. The conclusion is drawn that the ash should not be above 6.5 per cent for black pepper and 3 per cent for white pepper; that the ether extract should be between 7.5 and 10 per cent for black pepper, and 6 and 9 per cent for white pepper; and that in a good black pepper, piperin should be present to the extent of from 5.5 to 9 per cent.

Existence of salicylic acid in wines, grapes, and other fruits, H. MASTBAUM (*Chem. Ztg., 27 (1903), p. 829; abs. in Analyst, 28 (1903), No. 331, pp. 293, 294*).—A review of the work on the natural occurrence of salicylic acid in plants, and a report of the author's recent investigations, which, in his opinion, indicate the presence of salicylic acid in wines and strawberries. In the case of grapes it was found principally in the stalks, and in the case of the strawberries in the fruit stalks and calices. Before flowering gallic acid, but no salicylic acid, was found in the stems, leaves, and roots. The fruit stalks of sweet and sour cherries, pears, apples, and bananas were not found to contain salicylic acid.

Thirty years' progress in water analysis, ELLEN H. RICHARDS (*Science, n. ser., 19 (1904), No. 481, pp. 443, 444*).—A brief historical summary showing how the wholesomeness of water is now considered to be more a matter of dangerous organisms than of organic matter.

Proceedings of the second annual meeting of the Association of German Food Chemists (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6 (1903), No. 20, pp. 913–975*).—The meeting was held at Bonn, August 3–4, 1903. Papers on the following subjects were presented and discussed: The Use of Yeast as a Reagent in Food Chemistry, by E. Prior; The Results of the Biological Investigations of Proteids in Regard to their Application to Food Chemistry, by A. Partheil (see p. 850); Sulphuric Acid in Wine, by L. Grünhut; Notes on the Control of the Sale of Edible Fungi, by K. Giesenhagen (for earlier work, see E. S. R., 14, p. 477); The Examination of Vinegar, by G. Popp (see p. 886); Spices, by A. Beythien (see p. 886); Homogenized Milk, by P. Buttenberg (E. S. R., 15, p. 714); and Observations in the Field of Water Examination, by H. Grosse-Bohle. The general discussion following each paper is summarized.

Physical and microscopical examination of commercial products, K. HAS-

SACK (*Physikalische und mikroskopische Warenprüfungen. Vienna and Leipzig: A. Pichlers Witwe & Son, 1903, pp. IV+145; rev. in Oesterr. Chem. Ztg., 6 (1903), No. 23, p. 540*).—A manual designed for self-instruction as well as laboratory use.

Practical physiological chemistry, J. A. and T. H. MILROY (*New York: Longmans, Green & Co., 1904, pp. XII+200, pls. 8*).—A text-book providing material for a course of approximately 3 months. The principal constituents of the animal body and of food stuffs are considered, and both qualitative and quantitative analysis are taken up. The appendix contains a number of tables.

Text-book of physiological and pathological chemistry, E. SALKOWSKI (*Practicum der physiologischen und pathologischen Chemie. Berlin: August Hirschwald, 1900, 2. ed., pp. XVI+310, pl. 1, figs. 10*).—This volume is especially designed for medical students and students of physiological chemistry, and takes up both qualitative and quantitative analysis. Under the section devoted to qualitative analysis the following topics are included: Inorganic and physiological-chemical analysis and reactions of metals and acids. Under quantitative analysis: Urine, feces, meat, milk, bread, blood, and similar topics are considered.

A practical guide to qualitative and quantitative urine analysis and the analysis of gastric juice, F. SIGMUND (*Praktischer Leitfaden der qualitativen und quantitativen Harnanalyse nebst Analyse des Magensaftes. Wiesbaden: J. F. Bergmann, 1904, pp. 91; rev. in Oesterr. Chem. Ztg., 7 (1904), No. 2, p. 34*).—An introductory text-book and laboratory manual.

Progress in the field of agricultural chemistry in 1903, A. STUTZER (*Chem. Ztg., 28 (1904), No. 14, pp. 149–152*).—A brief summary, with numerous references to literature, of investigations relating to soils and fertilizers, plant physiology, plant diseases, feeding stuffs and feeding, and methods of investigation.

Annual report of the progress in animal chemistry, R. ANDREASCH and K. SPIRO (*Jahresber. Tier-Chem., 32 (1902), pp. 1142*).—This contains abstracts of the literature of animal chemistry for 1902, with subject and author indexes.

Report of the division of chemistry, A. M. PETER (*Kentucky Sta. Rpt. 1899, pp. XI–XXIX*).—This includes analyses of 63 samples of butter, 5 of sorghum, 6 of soils, 4 of tobacco stems, 2 of an egg preservative, 1 of asphalt rock, 1 of petroleum, 1 of supposed gold ore, 1 of a ferment for ripening cream, 11 of mineral waters, and 43 of numerous species of forage plants and grasses.

Chemical division, B. C. ASTON (*New Zealand Dept. Agr. Rpt. 1903, App. I, pp. 3–24*).—This is a report upon the work done during the year and includes analyses of 266 samples of butter, 26 of milk and cream, 3 of poultry foods, 4 of limestone, 8 of sugar beets, 32 of soils, 40 of waters, and of numerous samples of miscellaneous materials. The average water content of the 266 samples of butter from the different districts of New Zealand was 10.33 per cent, only 10 samples showing a water content above 13 per cent.

Adulterated drugs and chemicals, L. F. KEBLER (*U. S. Dept. Agr., Bureau of Chemistry Bul. 80, pp. 47*).—The author classifies the adulteration of drugs as conventional, accidental or incidental, arbitrary to take advantage of certain standards, and intentional; and illustrates each class by numerous examples taken from his investigations. A sample of chimaphilla leaves was found to contain 25 per cent of stems. Numerous reagents labeled chemically pure contained varying quantities of impurities. The author considers that the term at present means nothing. Samples of potassium cyanid labeled 98 to 100 per cent pure contained from 22 to 74 per cent of sodium cyanid. A sample of beeswax was found to contain 33 per cent of cassava starch. It is stated that 25 per cent of all turpentine purchased in small packages is liberally adulterated with kerosene. In many instances the goods as delivered were much inferior to the samples submitted.

A study was made of rose geranium oil which was found to be frequently adulterated. The sense of smell is considered the most satisfactory procedure available at present for determining the quality of this oil.

The author reviews the history of phenacetin, describes the methods of manufacture, gives the numerous physical and chemical tests which have been employed in the examination of this substance, reports the results of an examination of 9 commercial samples, of which 1 was found to be adulterated with acetanilid, and comments on commerce in phenacetin.

BOTANY.

The maple sap flow, C. H. JONES, A. W. EDSON, and W. J. MORSE (*Vermont Sta. Bul. 103, pp. 43–184, pls. 17, figs. 6*).—This bulletin gives the results of an extended series of observations on the cause of maple sap flow, the various factors influencing it, and some of the problems of the sugar orchard.

The investigations were begun in the winter of 1896–97 (E. S. R., 11, p. 318). The work has been carried on from season to season, and in the present bulletin the results of the continued observations are given. Two phases of the general subject were studied, the physiological and the chemical. The work was carried only to the collection of the sap, the commercial features of the industry having been intentionally omitted. A review is given of the general structure and physiology of the maple tree, and attempts are made to account for the presence of the sugar, the causes of sap flow, and the relation of various internal and external factors to the flow of the sap.

Among the possible explanations of sap flow are considered sap pressure, movement, and bleeding. Gas pressure seems to exert a considerable effect on the flow of maple sap, but the authors state that the sudden cessation of sap flow at the end of the sugar season when there are not only wide temperature variations but also the highest water content, are strong arguments against a purely physical explanation of sap flow. It is believed that most of the phenomena of sap pressure and flow are due to the inherent activities of the living cells. The activity of the protoplasm is known to vary quickly and widely in response to physical and chemical changes, and alterations in temperature may influence the protoplasmic activity directly or indirectly through the disturbance of the gas tension and the resultant sap movement. A marked fluctuation in the sap flow was noted, a suction-like motion following a strong sap flow. This is attributed in a great degree to temperature changes, the suction being due possibly to the reabsorption of the bleeding cells of the sap exuded by them into the adjacent cells. The composition of the sap was found to be somewhat variable from day to day and even from hour to hour.

Among the problems of the sugar orchard considered are the location and conformation of the trees in relation to sugar production, the location of the tap holes, variations in quantity and quality of sap, etc. It was found that maple trees well exposed to sunlight gave more and richer sap than those grown in crowded, shaded situations. The quantity of sap obtained from a tree averaged slightly higher on the side bearing the largest and most numerous branches, although individual trees varied in this particular. Almost without exception the largest yields of sap and sugar were derived from the tissues nearest the bark. Fully four-fifths of the sugar was obtained from a 3-inch boring in large first-growth trees, or from 1 to 1.5 in. in smaller second-growth trees.

Considering the yield of the entire season, little advantage is likely to arise from too carefully adjusting the points of tapping to the points of the compass. On typical sap days a southern exposure as a rule yielded the most sap and sugar, but on cloudy days the outcome was more uniform between the different points. As a rule, the larger the hole the greater the yield of sap or sugar, but for obvious reasons it is not desirable to wound the tree to such an extent, and tapping the tree with a bit of three-eighths to five-eighths inch is recommended. The maximum flow of sap generally occurred between 9 and 12 o'clock noon. After this time there was a

gradual diminution until about 3 p. m., when the flow practically ceased. Wide variations are noted between different sugar orchards and between the same orchard in different seasons.

The effect of tapping at different heights was investigated, and the greatest amount of sap, as well as the best quality, was obtained when the trees were tapped at a height of about 4 ft. A tree tapped at 3 different levels gave 27 per cent of its sap from the roots, 51 per cent at 4 ft., and 22 per cent at 14 ft. above the ground.

Data are appended giving the weather conditions and temperature records for the seasons 1898–1901, details of studies on annual rings of growth, the water content of trees at different dates, gas and other pressures, the individual records of sap flow, composition, etc.

The maple sap flow, J. L. Hills (*Vermont Sta. Bul. 105, pp. 195–222, figs. 3*).—A popular edition of Bulletin No. 103 of the station noted above.

Range conditions and range improvement, J. J. Thornber (*Arizona Sta. Rpt. 1903, pp. 342–344*).—A description is given of the range conditions of Arizona and the experiments which are being conducted for range improvement. An abundant rainfall during the winter caused the rapid development of the spring grazing, the principal species being *Plantago fastigiata*, alfilaria, and slender fescue. Attention is called to one of the grama grasses, *Bouteloua rothrockii*, as a desirable grass on account of its drought-resisting qualities. This grass does best without any cultural operations, disking the surface apparently being injurious.

During the latter part of June of the season reported upon storm-water embankments were constructed so as to increase the area overflowed. The areas watered by these dams were disked and sown with seeds of native and introduced forage plants, the more important of which were *Andropogon leucopogon*, *Panicum texanum*, *Bouteloua curtipendula*, *B. rothrockii*, *B. oligostachya*, *B. hirsuta*, *Sporobolus wrightii*, *S. strictus*, *S. cryptandrus*, *Pappophorum apertum*, *Chætochloa composita*, *Eriochloa punctata*, and *Chloris elegans*.

The wheat grasses of Wyoming, A. and E. E. Nelson (*Wyoming Sta. Bul. 59, pp. 34, pls. 5, figs. 6*).—An account is given of observations made on the wheat grasses of Wyoming, a number of species of which are described at considerable length. These grasses, which belong to the genus Agropyron, are among the best forage grasses of the region covered by the investigation. They readily divide themselves into 2 groups, those forming a dense sod and those growing in bunches. The different species are found to be suitable to special conditions of soil and moisture, the special adaptations of each being shown.

Pathogenic fungi, E. Pinoy (*Bul. Inst. Pasteur, 1 (1903), No. 20, pp. 761–774, figs. 12*).—An attempt is made to briefly describe the morphology of many pathogenic fungi and to classify them according to their botanical characters.

FERMENTATION—BACTERIOLOGY.

The value of tests for bacteria of specific types as an index of pollution, H. W. Clark and S. DeM. Gage (*Separate from Massachusetts State Bd. Health Rpt. 1902, pp. 39*).—The results of prolonged investigations, covering a wide field on the subject of water contamination, are given. According to the authors the principal types of bacteria used as indices of pollution are the colon type, the sporogenes, sewage streptococcus type, and occasionally others. The colon type, which has received the most study, is most widely distributed and is of the most value as a positive indication of sewage pollution. In the filtration of polluted water bacterial tests are of more value than chemical analyses. Long continued comparisons have shown that the *Bacillus coli* test is a more delicate indication of filter efficiency than the tests of the total number of bacteria present in filtered and unfiltered water.

In the examination of spring waters the degree of purity of the samples when collected in a careful and proper manner is almost absolutely shown by chemical

analyses. In these waters, as sold on the market, chemical analyses did not reveal such slight accidental contamination as might be produced by the introduction of *B. coli*, and this contamination might be of considerable importance.

In an examination of waters from driven wells comparisons were made of the chemical, bacterial, and *B. coli* analyses, and in all of 128 samples the different examinations were in entire agreement. Polluted waters that may become unfit for consumption at any moment are more plainly indicated by a single chemical analysis than by single determinations of *B. coli*.

In the examination of shellfish from suspected sources the determination of such bacteria as the colon bacillus is of considerable importance as showing the purity or pollution.

Comparative tests for the relative viability of *B. typhosus* and *B. coli* show that there is a great similarity in the 2 germs under a great variety of conditions. Both appear to follow the general laws of the removal of bacteria by sand filters. Both organisms are destroyed rapidly by cold, either in fluid culture or when frozen in ice. In ice both germs will live in slowly reducing numbers for a considerable length of time, and when subjected to heat both appear to follow about the same rule, the typhoid germs being destroyed in about five minutes' exposure at a temperature of 45° C. and nearly all of the *B. coli* in the same exposure at a temperature of 50° C. The thermal death point of both lies between 80 and 85° C., a point somewhat higher than has hitherto been set for these species. Both are rapidly destroyed by sunlight, an exposure of 30 minutes to 1 hour usually being sufficient to sterilize the culture when spread in a thin layer.

The practical value of tests for Bacillus coli in water, G. C. WHIPPLE (*Tech. Quart., 16 (1903), No. 1, pp. 18–31, figs. 2*).—According to the author, the methods necessary for the certain identification of *Bacillus coli* in water are so complicated that they are not practical as working tests in connection with the supervision of water supplies. The fermentation of dextrose broth is said to furnish the most rapid and practical test for the presence of this organism in water. *B. coli*, if not itself widely distributed in nature, is said to so resemble certain common bacteria in all the points covered by the usual tests as to throw doubt upon the use of this organism as a conclusive test for fecal contamination. The methods described by the author furnish a useful test to determine the sanitary quality of water, and give results that agree well with chemical and biological analyses.

Water molds and lime purification, H. SCHREIB (*Wasserpilze und Kalkreinigung. Berlin: M. Krayn, 1904, pp. X+176, pl. 1, maps 2*).

Some problems in fermentation, J. H. LONG (*Jour. Amer. Chem. Soc., 26 (1904), No. 2, pp. 117–133*).—An address upon this subject delivered before the meeting of the American Chemical Society at St. Louis, December 30, 1903.

METEOROLOGY—CLIMATOLOGY.

Annual summary of meteorological observations in the United States, 1903 (*Mo. Weather Rev., 31 (1903), No. 13, pp. VII+625–652, charts 8*).—This number gives a table of contents, list of corrections, additions, and changes, and an index for volume 31; and a summary of observations on temperature, pressure, precipitation, wind movement, cloudiness, and other meteorological phenomena "based essentially upon data received from about 166 regular Weather Bureau stations, 33 regular Canadian stations, and from such climate and crop sections as have forwarded their annual summaries in time." A report of the Chief of the Weather Bureau for the year ended June 30, 1903, is included.

Monthly Weather Review (*Mo. Weather Rev., 31 (1903), Nos. 10, pp. 449–502, figs. 6, charts 11; 11, pp. 503–563, pl. 1, figs. 15, charts 12; 12, pp. 565–624, figs. 9, charts 12*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of October, November, and

December, 1903, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 10.—Special contributions on Solar Radiation and Earth Temperatures (illus.), by C. G. Knott; Studies on the Circulation of the Atmospheres of the Sun and of the Earth—I.—The Circulation of the Sun's Atmosphere (illus.), by F. H. Bigelow; A Study of the Summer Fogs of Buzzards Bay, by F. W. Proctor; and A Photograph of Lightning at Havana, Cuba (illus.), by W. C. Devereaux; and notes on sun spots and the weather conditions on the earth, Weather Bureau men as instructors, sun-spot periods in meteorology, the noises made by projectiles and meteors, climate and mankind, reliability of high-wind records, the Philippine Weather Bureau, and long-range forecasting.

No. 11.—Special contributions on Studies on the Circulation of the Atmospheres of the Sun and of the Earth—II.—Synchronism of the Variations of the Solar Prominences with the Terrestrial Barometric Pressures and the Temperatures (illus.), by F. H. Bigelow; The Problem of the Cyclone (illus.), by F. J. B. Cordeiro; Clouds on the Cucamonga Mountains (illus.), by G. R. Rounthwaite; The Earthquake of December 5, 1903, at Washington, D. C., by C. F. Marvin; Mount Whitney as a Site for a Meteorological Observatory, by A. G. McAdie; Computation of the Altitude of Mount Whitney, by H. L. Heiskell; Mountain and Valley Breezes, by W. S. Tower; and Waterspouts at Cape May, N. J., August 24, 1902, by C. F. M. Leidy; and notes on Weather Bureau men as instructors, climatology of California, proposed pilot charts of the South Atlantic and of the South Pacific oceans, a daily weather map for the northern and southern hemispheres, the meteorological observatory at San Fernando, Spain, education of meteorologists, cooperation in Government work in science, aqueous vapor lines of the solar spectrum, seiches in Lake Garda, extremes of temperature and pressure in Montana, computation of the altitude of Mount Whitney, meteorology in the universities and normal schools, oscillations of temperature at any altitude, a waterspout, lightning phenomenon, the barometric disturbance in the Danish West Indies November 22–29, 1903, black rain in Clermont County, Ohio, August 19, 1903, vertical components of atmospheric motions, proportion of rainfall available for plant use, stationary and whirled psychrometers, meteor observed at South Bend, Ind., terrestrial globes, periodic floods in the Mississippi, island stations in the South Atlantic Ocean (illus.), and a new suggestion for thermometers.

No. 12.—Special contributions on The Use of Sounding Balloons for Meteorological Observations at Great Heights, by C. Renard; The Ascension of Closed Rubber Balloons, by H. Hergesell; Detailed Cloud Observations—A Progressive Phase in Weather Forecasting, by F. L. Odenbach; Methods of Forecasting the Weather, by J. M. Pernter; Kite Flying in the Tropics (illus.), by O. L. Fassig; Thunderstorms at Lincoln, Nebr., by J. H. Spencer; Recent Studies on the Solar Constant of Radiation (illus.), by C. G. Abbot; and The Polar Aurora of October 30–November 1, 1903, by J. Page; and notes on formation of hailstones (illus.), Weather Bureau men as instructors, meteorology and the art of flying, the thermophone applied to geodesy, periods in solar radiation and terrestrial temperatures, Southport exhibition of meteorological apparatus, the diffusion of odors in the atmosphere, low barometer during the "President" storm of March 12, 1841, the mischief of wrong theories, aurora and magnetic disturbances of October 30–November 1, 1903, storms on the southeast coast of Cape Colony, density of the atmosphere under different conditions, weather notes at West Cummington, Mass., international seismological association, meteorology in Hawaii, influence of continents and oceans on the atmosphere, and origin of the rare gases in the earth's atmosphere.

Meteorological observations, W. A. STOCKING, Jr. (*Connecticut Storrs Sta. Rpt. 1903, pp. 191–196*).—This is a record of observations on temperature, pressure, humidity, precipitation, and cloudiness during each month of 1902 at Storrs; rainfall during the 6 months ended October 31, 1902, at 21 places in Connecticut; monthly

mean temperature and monthly precipitation for 14 years (1888–1901); and dates of last and first killing frost for 14 years. The mean pressure for the year at Storrs was 30.01 in.; total precipitation, 52.12 in.; number of cloudy days, 142. The average rainfall for the State during the 6 months ended October 31 was 27.21 in. The mean annual temperature for 14 years has been 46.9°, the annual precipitation 46.99 in., the average length of growing season 147 days.

Meteorological summary for 1899, V. E. MUNCY (*Kentucky Sta. Rpt. 1899, pp. XXXV–XL*).—Tabular monthly summaries are given of observations at Lexington, Ky., on atmospheric pressure, temperature, precipitation, cloudiness, and wind. The mean barometric pressure for the year was 29.02 in., the highest 29.61, lowest 28.56; mean temperature 63.8° F.; highest 98, Sept. 6; lowest —20, February 13; total annual precipitation 40.24 in.

Meteorological observations in Jamaica (*Ann. Rpt. Dept. Pub. Gardens and Plantations and Bd. Agr. [Jamaica], 1903, pp. 9, 10*).—Tabular summaries are given of observations from April, 1902, to March, 1903, inclusive, at Hope, Castleton, and Hill Gardens on pressure, temperature, precipitation, dew-point, humidity, etc.

Meteorology of the fall of 1903, G. GINESTOUS (*Bul. Dir. Agr. et Com. [Tunis], 9 (1904), No. 30, pp. 138–159*).—Observations at a number of places in Tunis on rainfall, temperature, humidity, cloudiness, wind movement, etc., are summarized for the months of September to November, 1903.

WATER—SOILS.

Rural water supply, C. D. HOWARD (*West Virginia Sta. Bul. 89, pp. 163–213, pls. 5, figs. 2*).—This bulletin explains the danger from contamination of the water supply and the importance of providing pure water for domestic use, and reports and discusses analyses of water from various springs and wells in and around Morgantown, West Virginia, as well as from a small stream which was first used as a public water supply for the town, and from the Monongahela River, which is now used for that purpose. The wide variations in the volume and character of the water of this river are pointed out and the importance of employing means of purification is explained. The relation of water supply to typhoid epidemics is discussed and a list of publications relating to the general subject of water supply is given.

Poison in water from a gold and silver mill, P. A. YODER (*Utah Sta. Bul. 81, pp. 199–202*).—An analysis of a sample of water from the tail race from a gold and silver mill, which was supposed to have poisoned a number of cattle, is reported. This showed the water to contain 35 parts of lead, 5.1 parts of copper, and 166.6 parts of arsenic trioxid in 100,000 parts of water. "The water was so highly charged with arsenic that an ordinary drink for man or beast would contain sufficient to kill."

Results of rain, river, and evaporation observations made in New South Wales during 1900, H. C. RUSSELL (*Sydney: Dept. Pub. Instruction, 1903, pp. LXVI+139, maps 3, dgms. 4*).

Soil surveys in the United States, J. A. BONSTEEL (*Cornell Countryman, 1 (1904), No. 4, pp. 107–109*).—A brief historical review of soil-survey work in the United States, with a short account of the work of the Bureau of Soils of this Department, especially that done in cooperation with the agricultural colleges and experiment stations.

Fourth and fifth annual reports on the soils of Dorset, J. PERCIVAL and C. M. LUXMOORE (*Univ. Ext. Col. Reading [England], Agr. Dept., Ann. Rpt., Soils, Dorset, 1903, pp. 28, 19*).—A report is given of results of examinations of the fourth and fifth installments of 21 and 19 samples, respectively, of Dorset soils investigated under the terms of an agreement explained in an earlier report (E. S. R., 11, p. 327). The report gives the results of laboratory examinations and field observations.

The fertility balance in soils, S. GUÉRAUD DE LAHARPE (*Jour. Agr. Prat., n. ser., 7 (1904), No. 8, pp. 259–262*).—A discussion of an example of the maintenance of

soil fertility by the use of manures and fertilizers, by rotation, and by using on the farm purchased feeding stuffs, etc., rich in fertilizing constituents.

On the importance of certain physical properties of soils and soil-forming minerals in plant culture, W. BAGGER (*Inaug. Diss., Albertus-Univ. Königsberg, 1902, pp. 84, pls. 2*).—Studies of the physical properties of soils as based upon investigations of the size, character, and arrangement of the soil particles in a large number of soils are reported. The results of an attempt to trace a relation between the mechanical condition of the soil (size of soil particles) and the potash content are also reported.

The main conclusions reached are as follows: (1) Apparently only the crystalline substances in soils remain in suspension. (2) The arrangement of the mineral particles is determined to a large extent by their form. (3) The water capacity of a soil increases with a decrease in the size of the soil particles. It is clearly dependent upon the form of mineral and the resulting arrangement of soil particles. (4) The permeability declines uniformly with the decrease in size of particle, but not with decreasing compactness of arrangement of particles. (5) Cohesion in fine-grained soils increases with the decrease in the size of the particles. The form and the adhesive properties of the mineral constituents have an important influence on the cohesion. There is no clear distinction between sand and loam. In an agricultural sense sand may be defined as a collection of soil particles of varying size resulting from incomplete disintegration of amorphous or crystalline substances. Loam may be defined as a collection of small soil particles derived from complete disintegration of crystalline substances. (6) The mechanical properties (size of particles) of a soil furnish no index of potash content.

A review of the more important fertilizer experiments on black soil, W. VON WIENER (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 397–409, pl. 1*).—Experiments on typical steppes black soil underlaid by loess, at the agricultural experiment station and on a farm near Nowossil, Government of Tula, Russia, are reported. The physical and chemical properties of the soil are described. A large number of crops, including cereals, leguminous plants, root crops, fiber plants, etc., and various combinations of fertilizing materials as well as manure, were experimented with. In all cases phosphoric acid was the element of plant food which gave best results. Nitrogen and potash were practically without effect. Barnyard manure gave better results than mineral fertilizer, the most effective form being fresh horse dung. The best returns from the fertilizers and manures were obtained when their use was accompanied with deep and thorough culture.

Factors of availability of potash and phosphoric acid in soils, G. S. FRAPS (*Science, n. ser., 19 (1904), No. 481, p. 443*).—This is an abstract of a paper presented at the St. Louis meeting of the American Association for the Advancement of Science. "In the determination of plant food in soils, chemists have usually considered only that part which is soluble in the common solvents. Solubility is not, however, the only factor of fertility in the soil. The rate of decomposition or weathering of the soil is of great importance, as is also the power of the plants to assimilate. Weathering has received little or no attention. It is known to be of great importance with nitrogenous bodies, but in regard to phosphorus and potash no data can be given. Experiments show that there is a slight increase in both phosphoric acid and potash when the soil is kept moist, and a great increase in potash when organic matter is present. This accounts for the necessity for vegetable matter in soils. Another factor is the difference in the solvent powers of plants. A soil may contain sufficient food for one plant, but not enough for another."

Reply to an address: Present status of soil investigation, F. K. CAMERON (*Science, n. ser., 19 (1904), No. 478, pp. 343–347*).—This is in reply to criticisms of Bulletin 22 of the Bureau of Soils by C. G. Hopkins and others (E. S. R., 15, p. 329).

The nitrogen of the soil, VIBRANS (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 8, pp. 47, 48*).—A brief discussion of practical means of maintaining the nitrogen balance in cultivated soils.

Bacteriological studies of the soil, T. REMY (*Centbl. Bakt. u. Par., 2. Abt., 8 (1902), Nos. 21, pp. 657–662; 22, pp. 699–705; 23, pp. 728–735; 24, pp. 761–769; abs. in Centbl. Agr. Chem., 33 (1904), No. 2, pp. 75–79*).—This is a report of a series of culture tests with organisms from different kinds of soil to study nitrifying capacity, denitrifying action, the relation of bacteria content of the soil to productiveness, and similar questions.

Reclamation of salt and alkali lands, T. H. MEANS (*Forestry and Irrig., 10 (1904), No. 3, pp. 123–130, figs. 6*).—A discussion of this subject based upon recent observations in Egypt, showing the applicability of the methods followed there to similar problems in the United States. (See also E. S. R., 15, pp. 22, 234.)

Reclamation of alkali land near Salt Lake City, Utah, W. H. HEILEMAN (*U. S. Dept. Agr., Bureau of Soils Circ. 12, pp. 8*).—An account is here given of experiments made in cooperation with the Utah Station on a 40-acre tract of alkali land lying between Salt Lake City and Salt Lake, in which an attempt was made to demonstrate the practicability of reclaiming such land by means of underdraining and flooding. The operations began in 1902. The system for the 40 acres included 8 lateral drains of 4-in. and 3-in. drain tile, and 1 main drain of 10-in. tile. "Over the great part of the tract the drains were laid at a depth of 4 ft. In that part nearer the lake a somewhat shallower depth was necessitated in order to obtain a gravity outlet for the drainage water. The drains were laid on a grade of not less than one-tenth foot in 100 ft., except where 3-in. tile was used, when the grade was somewhat higher." The cost of the installation was about $660.

"Flooding has been carried on systematically, the land being divided into checks and plats by levees, and each plat treated in rotation. During each flooding water has been added to an average depth of 4 in. . . . During the last season (1903) the land was flooded once each week, with occasional longer intervals. . . . The land, at the time work was commenced, was all strongly impregnated with alkali salts, and had nothing growing upon it except a few alkali weeds, the most prominent of which was greasewood (*Sarcobatus vermiculatus*). The land was considered valueless by the farmers of the neighborhood."

Data are given which show "that between September, 1902, and the following May, 3,171 tons of salt had been removed from the soil to a depth of 4 ft., and that between September, 1902, and the following October, 5,430 tons had been removed, or 82 per cent of the alkali originally in the first 4 ft. of soil. It is also seen that a greater proportion of the alkali has been washed out of the surface foot than out of the lower depths, and that the movement of the salts is less pronounced as the depth increases. . . .

"The total volume of drainage was 5,651,776 cu. ft., or 51.8 per cent of the water added to the tract. This 51.8 per cent drainage water carried 3,648 tons of salts over the outlet weir. The remainder of the salts removed from the tract have passed into the deeper subsoil and been carried away by the natural subdrainage.

"The results so far obtained indicate the ultimate complete reclamation of the land. The single season's operations produced marked improvement in the land, not only in the alkali content, as shown by the soil tests made, or as shown by the salts in the drainage, but also as shown in the improved tilth of the soil and the favorable changes that have taken place in its physical properties.

"The indications are that the greater part of the tract is at present sufficiently sweetened to allow the growing of shallow-rooted crops."

The geomorphogeny of the Upper Kern basin, A. C. LAWSON (*Univ. California Bul. Dept. Geol., 3 (1904), No. 15, pp. 291–376, pls. 15*).

FERTILIZERS.

A treatise on manures, A. B. GRIFFITHS (*London: Whittaker & Co.; New York, 1903, 3. ed., rev. and enl., pp. XVI+453, pls. 3, figs. 17*).

Green manuring on the better class of soils, W. SCHNEIDEWIND (*Deut. Landw. Presse, 31 (1904), No. 7, pp. 45, 46*).—A brief account of the results of experiments made at Lauchstädt.

The preparation and use in agriculture of lime nitrogen, M. GERLACH (*Mitt. Deut. Landw. Gesell., 19 (1904), No. 8, pp. 45, 46*).—A brief account is given of methods of preparing this substance and of field experiments to test its fertilizing value. Earlier experiments by Wagner and the author (E. S. R., 15, p. 25), showing that the availability of this form of nitrogen is very nearly the same as that of nitrogen in form of ammonia salts and nitrate, are referred to. It is pointed out, however, that more recent farm trials have not shown so high a degree of availability, being on an average only about three-fourths of that of nitrogen in form of nitrate. It was found also that later applications were more effective than earlier applications, and that on certain soils (for example, moor soils) the lime nitrogen had an injurious effect, due, it is suggested, to the formation of dicyandiamid, which is apparently poisonous to vegetation.

Sulphate of ammonia or nitrate of soda? LILIENTHAL (*Fühling's Landw. Ztg., 53 (1904), No. 4, pp. 129–134*).—Comparative tests with potatoes on light sandy soil of nitrate of soda and sulphate of ammonia, with and without the addition of lime, are reported. The results with the sulphate were equal to and in some cases superior to those with the nitrate.

Under what conditions and by what means may ammoniacal nitrogen be made most effective? P. WAGNER (*Jahrb. Deut. Landw. Gesell., 18 (1903), pp. 37–49*).—A general discussion of the fertilizing value of the nitrogen of ammonium salts under various conditions.

Pot experiments on the influence of liming and marling on the yield of serradella, R. ULBRICHT (*Landw. Vers. Stat., 59 (1904), No. 5–6, pp. 425–432, pls. 2*).—The method used in experiments during 1900 and 1901 was the same as that followed in earlier experiments (E. S. R., 14, p. 129). Burnt lime and magnesite, marl, and ground limestone were experimented with. Applications of lime in all forms decreased the yield, showing that the growth of serradella, like that of lupines, is injuriously affected by this substance. The addition of magnesia to the lime still further decreased the yield.

On precipitated superphosphate as a substitute for Thomas slag, A. EMMERLING (*Deut. Landw. Presse, 31 (1904), No. 14, pp. 107, 108*).—Various methods of preparing precipitated phosphate by mixing superphosphate with calcium carbonate (chalk) and combining this mixture with potash and nitrogen salts are described. Analyses and field experiments with the various mixtures are reported. The results show that very effective fertilizers may be prepared in this way.

The use of crude potash salts in German agriculture in 1898 and 1902, G. SIEMSSEN (*Arb. Deut. Landw. Gesell., 1904, No. 88, pp. 24, map 1*).—Detailed statistics are given. The total amount used in 1898 is reported to be 7,604,754 kg. (8,365.23 tons); in 1902, 10,788,625 kg. (11,867.49 tons).

Progress in the potash industry in 1903, M. HAGEN (*Chem. Ztg., 28 (1904), No. 18, pp. 206–209*).—A brief review with references to literature.

FIELD CROPS.

Field experiments, F. C. BURTIS and L. A. MOORHOUSE (*Oklahoma Sta. Bul. [illegible], pp. 22*).—The results obtained in 1900 with sugar beets and mangels showed the value of soaking beet and mangel seed before planting. Two varieties each of sugar

beets and mangels were planted without previously soaking the seed, and in neither case was a stand secured, while a perfect stand resulted from old sugar-beet seed soaked over 24 hours before planting. The seed was planted April 16 and the beets, yielding at the rate of 9.81 tons per acre, were harvested the last week in November.

In 1901 Mammoth Long Red and Golden Tankard mangels and White Improved sugar beets gave a good average yield. The next year the varieties and yields were as follows: Mammoth Long Red 17.5 tons, White Kleinwanzlebener 14.1 tons and Golden Tankard 13.3 tons per acre. Freezing of the soil on December 3 injured the Mammoth Long Red mangels, which grow largely above the surface, while it did but little damage to the White Kleinwanzlebener, which seemed to be protected by a very heavy top and by a deeper growth. The following yields were obtained in 1903: Golden Tankard, 13 tons, and White Kleinwanzlebener 7.27 tons, Long Red mangel, 7.2 tons per acre. The treatment of these root crops under experiment is described and general directions are given for the culture of sugar beets and mangels in Oklahoma.

Kafir corn from 1900 to 1903, inclusive, on heavy upland soil produced on an average for the 4 years on manured ground 51 per cent more stover and 19.7 per cent more grain, and on unmanured ground 59.2 per cent more stover and 48.5 per cent more grain than corn. Samples of Kafir corn and corn stover from the crop of 1902 contained 75.80 and 80.22 per cent of dry matter, respectively. The culture and uses of Kafir corn are discussed.

In 1900 Texas Red oats drilled March 2 at the rate of 3.2 bu. per acre and harvested June 16, yielded at the rate of 72 bu. of grain and 2.19 tons of straw per acre. The following year this same variety on 2 manured and 2 unmanured plats produced on an average 54.5 bu. of grain and 1.24 tons of straw and 28.6 bu. of grain and 0.54 tons of straw per acre, respectively. Lincoln, Culberson, and Texas Red, compared in 1902, yielded 57.5, 46.4, and 45.3 bu. of grain and 1.29, 1.03, and 1.13 tons of straw per acre, respectively. Texas Red has in general given the best results. In 1903 oats in rotation produced a larger yield of straw, but 1.48 bu. of grain per acre less on plats manured for cotton the year before than on unmanured plats.

In addition to these tests experiments on the time of seeding and the preparation of the seed bed were carried on. The seedings were made March 17–20, March 28–31, and April 7–9. The early seeding gave the lowest yield of straw and the highest yield of grain and also the heaviest weight of grain per bushel. In early seeding plowing gave larger yields of grain than plats receiving surface cultivation only by disking. With the later seedings the reverse was the case, but the yield of straw was larger on the plowed plats. The more luxuriantly growing crop on the plowed plats seemed the most subject to rust.

Results obtained in 1903 from trial plats of grain, fodder corn, field roots, and potatoes, W. SAUNDERS (*Canada Cent. Ext. Farm Bul. 44, pp. 63*).—This bulletin is the customary annual report of cooperative variety tests now in progress for 9 years at the Canada Experimental Farms (E. S. R., 14, p. 751). The yields of the different crops at the several farms are given in tables. The varieties producing the largest crops in 1903, taking the average results obtained on all the experimental farms and giving them in the order of their productiveness, were as follows:

Oats.—Abundance, White Giant, Wide Awake, Sensation, Danish Island, Lincoln, Banner, Golden Tartarian, Waverly, Thousand Dollar, Improved Ligowo, and Twentieth Century. Average yield per acre, 90 bu. 30 lbs. *Two-rowed barley.*—Invincible, French Chevalier, Canadian Thorpe, Standwell, Beaver, and Danish Chevalier. Average yield per acre, 53 bu. 46 lbs. *Six-rowed barley.*—Mansbury, Brome, Odessa, Trooper, Oderbruch, and Nugent. Average yield per acre, 60 bu. 35 lbs. *Spring wheat.*—Advance, Roumanian, Wellman Fife, Byron, Monarch, Preston, White Connell, White Fife, Goose, Chester, Crawford, and Clyde. Average yield per acre, 33 bu. 18 lbs. *Peas.*—English Grey, Macoun, Early Britain, Archer, Crown, Alma, German White,

Pride, Arthur, Mackay, Wisconsin Blue, and Mummy. Average yield per acre, 40 bu. 59 lbs. *Indian corn.*—Early Mastodon, Thoroughbred White Flint, Eureka, Angel of Midnight, Giant Prolific Ensilage, and Superior Fodder. Average yield per acre, 20 tons 753 lbs. *Turnips.*—Mammoth Clyde, New Century, Emperor Swede, Jumbo, Hartley Bronze, and Perfection Swede. Average yield per acre, 37 tons 929 lbs. *Mangels.*—Mammoth Long Red, Mammoth Yellow Intermediate, Half Long Sugar White, Selected Yellow Globe, Giant Yellow Intermediate, and Lion Yellow Intermediate. Average yield per acre, 36 tons 1,732 lbs. *Carrots.*—Ontario Champion, Giant White Vosges, Mammoth White Intermediate, New White Intermediate, Improved Short White, and White Belgian. Average yield per acre, 22 tons 3 lbs. *Sugar beets.*—Red Top Sugar, Improved Imperial, Danish Red Top, and Danish Improved. Average yield per acre, 28 tons 285 lbs. *Potatoes.*—Seedling No. 7, Vanier, Rose No. 9, Rochester Rose, Carman No. 1, Enormous, Late Puritan, Burnaby Seedling, Everett, Uncle Sam, Canadian Beauty, and Pearce. Average yield per acre, 425 bu. 32 lbs.

Emmer was grown last season at all of the experimental farms with yields varying from 17 bu. 20 lbs. to 43 bu. 44 lbs. per acre.

The average results of the various crops for a series of years are also given. The following varieties, taking the average of the yields obtained on all the experimental farms, have been the most productive: *Oats.*—Danish Island, Banner, Mennonite, New Zealand, American Beauty, White Giant, Thousand Dollar, Black Beauty, Holstein Prolific, Improved American, Buckbee Illinois, and Golden Tartarian. Average yield per acre, 76 bu. 6 lbs. *Two-rowed barley.*—French Chevalier, Dunham, Canadian Thorpe, Danish Chevalier, Clifford, and Beaver. Average yield per acre, 45 bu. 29 lbs. *Six-rowed barley.*—Manshury, Claude, Mansfield, Yale, Odessa, and Brome. Average yield per acre, 50 bu. 43 lbs. *Spring wheat.*—Roumanian, Clyde, Laurel, Preston, Goose, Monarch, Wellman Fife, Rio Grande, White Fife, Huron, Red Fife, and Weldon. Average yield per acre, 34 bu. 20 lbs. *Peas.*—Crown, Pride, English Grey, Early Britain, German White, Pearl, Carleton, Picton, King, Arthur, Paragon, and Agnes. Average yield per acre, 35 bu. 41 lbs. *Indian corn.*—Early Mastodon, Superior Fodder, Thoroughbred White Flint, Salzer All Gold, Red Cob Ensilage, and Early Butler. Average yield per acre, 19 tons 867 lbs. *Turnips.*—Perfection Swede, Imperial Swede, Halewood Bronze Top, Selected Purple Top, Magnum Bonum, and Hall Westbury. Average yield per acre, 31 tons 927 lbs. *Mangels.*—Giant Yellow Intermediate, Yellow Intermediate, Lion Yellow Intermediate, Mammoth Long Red, Mammoth Yellow Intermediate, and Gate Post. Average yield per acre, 31 tons 1,514 lbs. *Carrots.*—New White Intermediate, Giant White Vosges, Ontario Champion, Mammoth White Intermediate, Improved Short White, and Half Long White. Average yield per acre, 22 tons 84 lbs. *Sugar beets.*—Danish Red Top, Danish Improved, Red Top Sugar, and Improved Imperial. Average yield per acre, 24 tons 932 lbs. *Potatoes.*—Uncle Sam, Seedling No. 7, Irish Daisy, American Wonder, Rose No. 9, American Giant, Late Puritan, Country Gentleman, Carman No. 1, Burnaby Seedling, Penn Manor, and State of Maine. Average yield per acre, 377 bu. 53 lbs.

Alfalfa, sorghum, soy beans, and other forage plants, J. F. DUGGAR and J. M. RICHESON (*Alabama Canebrake Sta. Bul. 20, pp. 20*).—Alfalfa sown broadcast March 20 yielded, from 3 cuttings made June 16, July 15, and September 3, a total of 4,634 lbs. of hay, being at the rate of 8,424 lbs. per acre. The land was upland prairie of a fair degree of fertility, and the results are considered very good for the first season of spring-sown alfalfa. The soil on which the crop was grown seemed to have been inoculated from adjacent fields on which alfalfa and melilotus had been produced. The culture and value of alfalfa in the canebrake region are noted.

The yields of a number of summer-growing forage crops on a dark upland prairie soil, all planted in drills about May 1 and giving good stands, except the teosinte, are shown in the following table:

Yields of various forage plants per acre.

Crop.	Date of each cutting.	Green forage per acre.	Weight of hay per acre when stored.	Yield of hay calculated as 40 per cent of green weight.
		Lbs.	*Lbs.*	*Lbs.*
Amber sorghum, first cutting	Aug. 11	27,040	20,640	10,816
Amber sorghum, second cutting	Oct. 12	15,648	8,256	6,259
Amber sorghum, total	....	42,688	28,896	17,075
Orange sorghum, first cutting	Aug. 17	34,606	23,360	13,862
Orange sorghum, second cutting	Oct. 26	14,080	8,832	5,632
Orange sorghum, total	....	48,736	32,292	19,494
White Kafir corn	Sept. 8	19,712	11,584	7,885
Red Kafir corn	....do....	17,552	13,728	8,721
Pearl or Cattail millet	Aug. 17	17,216	8,640	6,886
Welborn corn (for grain) stover	Oct. 4	....	1,680	....
Teosinte	Aug. 27	5,888	3,200	2,355
German millet	Aug. 6	6,464	4,032	2,155
Yellow soy beans	Sept. 8	27,136	13,568	9,405
Whippoorwill cowpeas	Aug. 27	11,088	4,672	3,696
Wonderful cowpeas	Sept. 19	15,872	7,456	5,291
New Era cowpeas	Aug. 27	7,872	2,976	2,624

On dark pebbly land which had produced a crop of poor wheat, a mixture of 3 pecks of Amber sorghum and 5 pecks of cowpeas sown broadcast yielded 5,760 lbs. of hay per acre, the weight being taken after 8 days of curing. In this same series of plats Mexican June corn yielded 2,288 lbs. of stover and 19.25 bu. of corn, but this crop occupied the land until October while the other crops occupied it only for 67 days.

In a test of crops suitable for hog feeding, Welborn corn yielded 21.1, yellow soy beans 34.1, Spanish peanuts 58.3, Virginia peanuts 116.5, and sweet potatoes 64.3 bu. per acre. In the same experiment 800 lbs. of sunflower seed were obtained per acre. A plat of late sorghum without fertilizer produced 11,200 lbs. of green forage, while another plat receiving 70 lbs. of nitrate of soda per acre yielded 18,272 lbs. Seed of the Newman bean, obtained from this Department and sown March 28, gave a yield of 20,398 lbs. of green crop or 8,158 lbs. of cured material by September 8. In addition to the different crops mentioned melilotus, hairy vetch, and Dwarf Essex rape were grown and produced good yields.

The hay meadow with special reference to culture and irrigation, W. Quitzow (*Inaug. Diss., Ver. Friedrichs-Univ. Halle-Wittenberg, 1902, pp. 29, map 1*).—A discussion of this subject with reference to conditions around Seehausen.

The work of the Community Demonstration Farm at Terrell, Texas, S. A. Knapp (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 2, pp. 8*).—A brief account of a demonstration experiment on a farm which had been in corn and cotton continuously for 28 years, and was in an impoverished condition. Thorough preparation and cultivation were given, and complete fertilizers containing admixtures of cotton-seed meal were applied freely. Corn and cotton were the crops grown. As a result of the demonstration, the farm manager announced at the end of the season that "he had cleared $700 more than would have been made under the ordinary methods of farming employed in that section."

Experiments with cotton and corn in 1903, J. F. Duggar and J. M. Richeson (*Alabama Canebrake Sta. Bul. 21, pp. 20*).—In the culture tests reported with cotton,

land plowed 6½ in. deep yielded 76 lbs. of seed cotton and 16 lbs. of lint more per acre than land plowed 3½ in. deep. Subsoiling did not materially affect the yield of lint. Cotton planted on ridges yielded 344 lbs. of lint per acre as compared with 272 lbs. when planted on beds in the usual way. Ridge planting, however, is considered more likely to suffer from drought. The use of a cultivator gave practically as large a yield as the use of the sweep. An additional cultivation given September 19 apparently increased the yield of lint cotton per acre by 40 lbs. over a plat laid by August 26.

Slag phosphate and acid phosphate each applied at the rate of 200 lbs. per acre on black slough land failed to increase the yield but hastened maturity to some extent. Different forms of potash were also used without material effect. In a test with nitrogenous fertilizers, plats receiving 160, 80, and 40 lbs. of nitrate of soda per acre yielded 112, 64, and 48 lbs. of lint cotton more per acre than the check plat. The increase in yield from 100 lbs. of cotton-seed meal per acre was the same as that obtained from 40 lbs. of nitrate of soda. An application of 3,200 lbs. per acre of barnyard manure apparently increased the yield of lint by 80 lbs., and the same application of corn stover by 16 lbs. per acre.

The best-yielding varieties of corn under test were Shaw Improved, Blount Prolific, and Cocke Prolific, producing 37.7, 35.4, and 34.9 bu. of corn and 2,176, 1,360, and 1,840 lbs. of stover per acre, respectively. Two plats subsoiled on April 4 yielded on an average 2.5 bu. per acre less than 2 plats not subsoiled. No material difference resulted from different methods of preparing the soil and planting. In a cultivation test the best yield was obtained from the use of the 12-in. sweep at the first cultivation and the subsequent use of the 20-in. sweep. Owing to a very wet season the continuous use of the turnplow gave very good results.

Among different fertilizer applications, 88 lbs. of nitrate of soda per acre applied at the second cultivation gave the largest increase in yield. The same increase was obtained from 44 lbs. nitrate of soda and 100 lbs. of cotton-seed meal applied together at the first cultivation. The increase obtained from 88 lbs. of nitrate of soda per acre applied at planting was smaller by 2 bu. than when the application was given at the second cultivation. Manure applied before planting at the rate of 2,702 lbs. per acre yielded a return of $2.20 per ton. In a second test 5,408 lbs. of manure per acre gave an increase of only 4 bu., while 200 lbs. of cotton-seed meal and 80 lbs. of nitrate of soda increased the yield by 7.1 and 7 bu. per acre, respectively. Nitrate of soda was applied at the third cultivation, June 12, 2½ months after planting.

Direct application of nitrate of soda and cotton-seed meal failed to increase the yield of Mexican June corn, but the residual effect of 1,600 lbs. of cotton-seed meal applied to the immediately preceding crop of oats showed a gain of 7.2 bu. per acre. Subsoiling apparently decreased the yield.

Selecting and improving corn, A. M. Soule (*Univ. Tennessee Record, 7 (1904), No. 1, pp. 13–27, figs. 10*).—The value and methods of selecting and improving corn are discussed at some length, and results of planter and variety tests are reported. The planter tests indicate that uniformity in the size of kernels insures uniformity in the number of kernels dropped by the machine, and consequently tends to produce an even stand. Attention is called to the importance of selecting varieties adapted to the locality, by the fact that on the University farm the varieties leading in yield in 1901, a dry year, were not among the leaders the following season, which was favorable, and others not represented in either year had a better average for the 2 seasons. The vitality test showed a low percentage of germination for butt, tip, and deformed kernels and soft corn. A score card for judging corn in the ear, in use at the College of Agriculture, is presented.

Cowpea hay, C. L. Newman (*Arkansas Sta. Bul. 80, pp. 69–82*).—The average yield at the station of cowpea hay for 5 years, from 1899 to 1903, as computed from all plats and all varieties recorded, was 3,169.4 lbs. per acre. This in general did not include the weight of peas and hulls. In 1902, 16 plats yielded over 6,000 lbs.

of hay per acre, and on 8 of these either no ripe peas or only a small quantity was produced. The highest yield of hay for this season, 8,750 lbs. per acre, is recorded for Clay, and the lowest, 750 lbs. per acre, for New Era and Extra Early Black Eye. The yields of shelled peas were 2.9 bushels and 1,337 and 1,025 lbs. per acre, respectively.

Since 1898 over 550 plats, including about 50 varieties, have been cut for hay. It was found that young or vigorously growing vines are always difficult to cure, while mature vines are cured much more rapidly. Varieties producing few or no peas are the most difficult to cure because they continue to grow until checked by frost. Late shallow cultivation prolongs the period of growth and the author recommends that cultivation should cease when the first pods appear, if the crop is grown for hay. Vines bearing a fair or full crop of peas well ripening together are easily cured when about one-fourth of the peas are ripe and no second growth is taking place, while if the peas ripen through a prolonged period the plants continue in vigorous growth and are difficult to cure unless the weather is most favorable.

Cowpea seed of the same varieties but obtained from different sources showed great variations in the yield of hay. At the station, Clay cowpeas from Virginia and Arkansas-grown seed in adjoining plats yielded 3,800 and 8,700 lbs. of hay per acre, respectively. Black Eye from Indiana produced 800 lbs., and the same variety from North Carolina 4,000 lbs. of hay per acre. New Era from Maryland seed yielded 700 lbs. of hay and 22 bu. of peas, and from home-grown seed 1,900 lbs. of hay and 19 bu. of peas per acre. Yields of hay for all varieties and seed from different sources are tabulated, and reference is made to previous work along this line (E. S. R., 15, p. 666).

In another experiment cowpeas were mown at different stages of growth to observe the effect of the degree of maturity on the curing of the vines for hay. The varieties under test ripened their first pods as follows: Warren New Hybrid August 15, Warren Extra Early August 20, Whip-poor-will August 28, Taylor September 8, and Clay September 14. The first mowing, made when the varieties were forming their first pods, proved unsuccessful for haymaking. The second mowing, made when the first pods ripened, gave good hay from Warren New Hybrid and Warren Extra Early. The first and second mowings of Clay and Taylor were failures, but good hay was produced from Taylor mown when half or all of the pods were ripe. The number of days from sowing until the first ripe pods appeared was as follows: Warren New Hybrid 67, Warren Extra Early 72, Whip-poor-will 80, Taylor 90, and Clay 97 days. Clay is a late grower and did not prove to be a very successful variety for hay.

In 1903, 12 varieties were planted on May 13 and July 8, and both varieties were mown at the same time. Of the different varieties New Era, Black Eye, and Warren Extra Early ripened a full crop of peas and the vines cured well. Brown Eye, California Black Eye, Large Black Eye, and Whip-poor-will ripened a fair quantity of pods and the vines cured into very good hay; while Brown Crowder, Clay Crowder, Conch, Lady, and Red Ripper were in vigorous growth with only a few ripe pods when mown, and produced a very inferior hay.

The results of four years' experiments with Whip-poor-will cowpeas show that the quantities of seed producing the largest yields of hay were in no case below 12.5 lbs. nor above 25 lbs. per acre, the average being about 16 lbs. Varying with 6 varieties in 1903, using from 6.25 to 100 lbs. per acre, the highest average yield of hay was produced from 25 lbs. of seed. Whip-poor-will in this test produced the heaviest yield from 12.5 lbs. per acre, Taylor from 100, and Warren New Hybrid from 25 and from 75 lbs. From 100 lbs. of seed Taylor yielded only 350 lbs. of hay more than from 37.5 lbs. The best yields of shelled peas were secured from not less than 12.5 nor more than 37.5 lbs. of seed per acre. Directions for harvesting and curing cowpea hay are given.

Observations on potato culture, A. Carré (*Prog. Agr. et Vit. (Éd. L'Est), 25 (1904), No. 8, pp. 235–242*).—The culture of the potato in France is discussed, sta-

tistics on the production given, and the results of experiments reported. A fertilizer test was made on a sandy, noncalcareous clay soil. The first or check plat received no fertilizer, the second received barnyard manure only, the third 400 kg. of superphosphate per hectare in addition to the manure, and the fourth 160 kg. of nitrate of soda per hectare in addition to the manure and the superphosphate. The increase per hectare in financial results on the second plat over the first was 120 francs, and on the third and fourth plats 105 and 210 francs, respectively, over the second. The average results of a cooperative experiment carried on by 24 farmers on this same plan gave an increase of 3,548 kg. of potatoes per hectare in favor of the application of commercial fertilizer.

Potato trials of 1903, E. S. BROWN (*Amer. Gard., 25 (1904), No. 473, pp. 133, 134*).—Of nearly 100 varieties tested the following are considered the most promising: Extra early varieties—Eureka, Early Snowball, Early Whiton, and Krine Lightning; early to medium varieties—Early Ohio, White Ohio, New Queen, Irish Cobbler, Red Triumph, Early Puritan, Early Michigan, Early Thorburn, and Peck Early; medium to late varieties—Potentate, Vornheim, King of Michigan, Chicago Market, and Great Divide; late and general purpose varieties—Green Mountain, Bonanza, Whiton Mammoth, and Yellow Elephant. Descriptive notes on these and on other leading varieties are given.

A method of storing potatoes, E. SCHRIBAUX (*Jour. Agr. Prat., n. ser., 7 (1904), No. 7, pp. 214, 215*).—The experiments here described are essentially trials of storing and growing potatoes in pulverized soil or sand kept in the dark. Early in June potatoes were planted in wooden boxes filled with moist potting earth and placed in a dark basement where the temperature varied but little from 15° C. The tubers were planted 6, 12, and 18 cm. deep in the same boxes. Practically no care was given them until the boxes were examined in December, when it was found that a crop of new potatoes amounting in weight to one-half that of the tubers planted had been produced near the surface of the soil.

The tubers of the new crop were all at the same level, although the planting had been at different depths. It was noticed that at a depth of 20 cm. some tubers produced only a few tender sprouts, and that by placing them somewhat deeper they can be kept without change, excepting a reduction of the starch content, until August. If placed too deep the tuber is deprived of oxygen, intramolecular respiration is substituted for normal respiration, and decomposition results.

Thickness of seeding in its relation to the yield and the development of the head of spring rye, E. GROSS (*Fühling's Landw. Ztg., 53 (1904), No. 2, pp. 57–60*).—Three series of plats were seeded with rye in the spring. Different quantities of seed were used, and the results obtained are shown in the following table:

Results with spring rye sown at different rates.

Seed per hectare.	Yield per hectare.		Weight per hectoliter.	Weight of stem.	Weight of head.	Weight per head.		Length of head.	Number of grains per head.	Grains per centimeter.
	Grain.	Straw.				Grains.	Chaff.			
Kg.	*Ql.*	*Ql.*	*Kg.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Cm.*		
160...	25.90	61.93	71.4	1.631	1.109	1.177	0.232	11.39	36.2	3.18
200...	24.78	68.18	70.4	1.590	1.316	1.093	.223	11.11	35.5	3.15
240...	24.20	66.27	69.9	1.495	1.132	.909	.223	10.95	29.4	2.69

Weather in its relation to the yield and quality of sugar beets, GROHMANN (*Deut. Landw. Presse, 31 (1904), No. 11, pp. 83, 84*).—Weather conditions in relation to sugar-beet culture are discussed and meteorological data, together with the average yield and quality of sugar beets for the years 1892 to 1900 inclusive, are given.

The observations of the author lead to the conclusion that sunshine is not very effective in the sugar production in the beet when the development of the plant has not been normal, but that otherwise the sugar content of the beet mainly depends upon the duration of sunshine during the last months of the vegetative period of the crop. Of the different factors affecting the yield of beets, moisture conditions are considered the most important. The production of sugar in the beet is influenced mainly by the duration of sunshine, and largely by favorable temperatures. Attention is called to the fact that heavy yields of beets often more than offset a low sugar content. The richest beets in this series of years were produced in 1900, but the yield of sugar per hectare was less than in 1894, when the sugar content of the beets was lowest.

The increase in the sugar content of pulled beets when topping is delayed, T. Remy (*Deut. Landw. Presse, 31 (1904), No. 15, pp. 119, 120*).—The composition of fodder beets and sugar beets topped immediately after pulling and stored in heaps covered with earth, was compared with that of beets pulled, placed in piles with their leaves exposed on the exterior of the piles, and topped 3 weeks later. The late-topped beets showed an increase in the percentage of dry matter and of sugar over the beets topped at the time of pulling. This increase was unimportant in the fodder beets, but in the sugar beets it amounted to 0.8 per cent, which, in the opinion of the author, is sufficient to merit consideration. The disadvantages of the method as pointed out are the loss of the leaves for fodder, the increase in labor, and the danger of frost injury in the unprotected heaps.

Annual report of the Bureau of Sugar Experiment Stations for the year 1902–3 (*Brisbane, Queensland: Bureau of Sugar Expt. Stas., 1903, pp. 39*).—This report contains accounts of laboratory work on soils of the Province, and experiments with varieties, methods of culture, fertilization, and irrigation of sugar cane, and on the manufacture of sugar from cane.

Sweet potatoes from seed (*Queensland Agr. Jour., 14 (1904), No. 2, p. 90*).—A report is here given of the growing of sweet potatoes from seed. The vines grown from seed were not very productive, but the tubers which were obtained were large and sound. Among some of the vines were a few lilac-colored stalks. These were planted out with the result that a potato having a different color and a leaf of different shape was obtained. It is thought probable that the vines thus grown from seed may be more resistant to the usual sweet potato diseases in the district than the ordinary sorts.

Ridge and level culture of swedes, G. L. Sutton (*Agr. Gaz. New South Wales, 15 (1904), No. 1, pp. 79, 80*).—The average yields per acre gave an increase of 18 cwt. and 23 lbs. in favor of level culture, but the crop on the ridges matured earlier.

Wheats and flours of Aroostook County, C. D. Woods and L. H. Merrill (*Maine Sta. Bul. 97, pp. 143–180, figs. 2*).—Maine-grown wheats represent Maine varieties grown within the State, and the samples of flour under test were obtained from 3 Aroostook County mills. The composition and heat of combustion of these flours are compared with those of flours obtained from Minneapolis. The results show that 8 samples of flour from Maine-grown wheats contained 3 per cent less protein than the flours from the western wheats, i. e., the western wheats contained one-fourth more protein than the Maine wheats. The dry matter of the western flour also contained one-fourth more fat and crude fiber, and 3½ per cent less starch and other carbohydrates than the samples from Maine-grown wheats. The heat of combustion was practically the same.

Baking tests showed that the Aroostook-milled flours were deficient in wet gluten as compared with the flour adopted as a standard by one of the Minneapolis mills. This defect is believed to be largely due to milling, and not solely to a lower gluten content of the grain.

The following table shows the differences in composition of wheats grown in different sections of the country:

Average composition and heat of combustion of Maine and western grown wheats, calculated to a water-free basis.

Wheats.	Nitrogen.	Protein (N×5.7).	Fat.	Crude fiber.	Nitrogen-free extract.	Ash.	Heat of combustion per grain.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
16 Maine wheats	2.14	12.20	2.56	2.70	80.52	2.02	4.424
12 western wheats	2.55	14.52	2.53	2.76	77.98	2.21	4.437
25 Minnesota wheats	2.47	14.09	2.30	2.53	78.92	2.16	4.328

Two experiments in growing northwestern wheat in Maine are reported. In the first seed of Lamona wheat from Washington and Wellman Fife and Blue Stem from Minnesota was sown. The resulting crop showed an increase in the weight of kernel in every case, amounting to almost 50 per cent with Blue Stem. Lamona, which has a heavy kernel, was only slightly affected in this particular but showed a marked decrease in protein, amounting to 21 per cent of the original. Fife also lost in protein, while Blue Stem made a slight gain. These 2 varieties also gained in gluten, but this gain was much too small to offset the loss in Lamona. The results in this first test were regarded as contradictory, and a second experiment on a larger scale was made under more favorable conditions. In this second test plats of some of the wheats were also grown in Minnesota for comparison. The results obtained again proved inconclusive. The principal differences appeared in the protein content and the weights of the kernels. The average protein content for the northwestern-grown wheats was 15.28 per cent and for the Maine-grown wheats from the same seed 14.27 per cent.

Milling tests were made to study the loss in Maine milling. The results show that it is possible to obtain from 72 to 75 per cent of the wheat in the form of flour. In one of the tests with Minnesota-grown wheat only 57.4 per cent of the wheat was recovered as flour, while in an experiment with Minnesota wheat at Minneapolis 73.1 per cent was recovered. The flour obtained in the first test carried 51 per cent of the nitrogen of the grain, and that obtained in the other, 69.6 per cent. The yield of flour in the other milling tests ranged from 70.2 per cent to 72.4 per cent in the Maine-grown wheats, 72.8 per cent in No. 1 Northwestern, and 68.4 per cent in No. 2 Northwestern wheat. Baking tests of the flours from these experiments revealed imperfections in the product, due to milling. Notes on the improvement of wheat are given.

HORTICULTURE.

Improvements in vegetables, J. O. THILOW (*Amer. Florist, 22 (1904), No. 824, pp. 316, 317, figs. 6*).—The author enumerates the various improvements which have taken place in recent years in the form, color, and quality of the following vegetables: Artichoke, asparagus, beans, beets, cabbage, celery, sweet corn, cucumbers, endive, lettuce, melons, onions, peas, radish, squash, and tomatoes. Some illustrations are given which show in outline the improvements which have been made with beans, beets, carrots, peppers, parsnips, and peas.

Standard varieties and interesting novelties (*Amer. Agr., 73 (1904), No. 6, p. 140*).—The experiences of a number of growers are here summarized as to the results secured with a number of vegetables, field crops, and small fruits. Varieties especially commended and described are the Brittle Wax beans, Fordhook Famous cucumber, Halbert Honey watermelon, Dwarf Stone and Early Trojan tomatoes, Mammoth Yellow Flint corn, White Evergreen and Troy Market sweet corn, Great White Maine oats, Iowa raspberry, and Hartford pear.

A new late cabbage from Russia (*Amer. Agr., 73 (1904), No. 6, p. 142*).—This is a variety of cabbage called the Volga which has been grown on Long Island during the past 9 years. The crop of 1903 was the fourth one from seed grown in this country. The heads of this variety are reported to weigh from 10 to 15 lbs. In shape it is midway between the Danish Ball Head and the Flat Dutch. It is considered one of the best for shipping and for kraut. It is a rapid-growing variety, valuable for a second crop. When planted the same time as the earliest varieties of Flat Dutch it made a solid head fully two weeks earlier than Early Summer, and 25 per cent larger. The heads are very uniform in size. In a field of 4 acres grown for seed purposes less than 1 per cent had to be thrown out. The variety is especially recommended as a quick-growing late sort.

Cantaloupe seed, B. K. Blinn (*Colorado Sta. Bul. 85, pp. 8, pls. 4*).—The author states that it is a common custom in the region where the Rocky Ford cantaloupes are grown in Colorado to use all those melons for seed at the close of the shipping season which may be green, overripe, large, or small. These are gathered without any attempt at selection, and run through the melon seeder. As a result of this method of selection a large percentage of melons grown at Rocky Ford are unmarketable either on account of size, form, defective netting, thin rinds, soft flesh, or other reasons. Illustrations are given showing the outward appearance of a desirable type of Rocky Ford melons produced by careful seed selection.

A typical Rocky Ford melon should be "slightly over 4 in. in diameter, and about 4⅝ in. long; it should have silver-gray netting that stands out like thick, heavy lace, practically covering the entire melon save the well-defined slate-colored stripes; these should run the whole length of the melon, clear cut as if grooved out with a round chisel, and terminating at the blossom end in a small button. The interstices in the netting should be light olive green, that turns slightly yellow when the melon is ready for market. A melon with a black skin under the netting is not so attractive in appearance. . . .

"The flesh should be thick and firm, of a smooth texture, and free from watery appearance, rich and melting in flavor. The shipping and keeping qualities depend largely on the solidity of the melon, so the seed cavity should be small and perfectly filled with seed. The color of the flesh near the rind should be dark green, shading lighter toward the seed cavity, which should be salmon or orange in color. The flesh is often mottled with salmon, and not uncommonly the entire flesh is of that color. The flavor is usually quite uniform, though it is sometimes affected by the health of the vines or other conditions of growth."

Directions are given for the different steps to be observed in selecting melons for seed. It has been found that it takes about one crate of melons to produce a pound of seed, and this fact should be made the basis of the price of selected cantaloupe seed. Melons should be selected from extra prolific hills and among those that ripen earliest in the season. With attention to the careful selection of seeds it is believed that practically all the melons produced can be marketed.

Growing cauliflower seed in Denmark (*Amer. Florist, 22 (1904), No. 824, p. 330, fig. 1*).—A description is given of the methods observed in Denmark in growing cauliflower seed for the trade.

Ginseng to date, F. O. Harrington (*Trans. Iowa Hort. Soc., 38 (1903), pp. 222–227*).—The author notes that by failing to mulch ginseng in Iowa during the winter of 1898 and 1899 one plat was wholly destroyed and another partially destroyed by the severe cold. Artificial shade was not used. Very successful results have been obtained by planting among evergreens and also in walnut groves. Seed produced during the summer of 1902 was sold at an average net price of 66 cts. per 100 seeds. It is estimated that the value of the seed obtained from one-seventh of an acre of genseng was $2,500. Some seed heads of 5-year-old plants produced from 100 to 166 seeds. The dried roots sold for $6.60 per pound.

With seed selling for the price mentioned, or at even half this amount, it is believed more profitable to grow seed than to dig the roots for drying. Special attention is called to the desirability of planting ginseng among shallow-rooting shade trees. The Scotch pine has proved especially valuable for shading purposes. It is sufficiently open to let the sunlight through almost everywhere, and it sheds a large amount of foliage for mulching material. White pine has also proved fairly good when the trees were not too numerous. Cedars and spruces should not be used at all. Beds under walnut trees have done very well. With the approach of winter the beds are now regularly covered over with about 3 in. of evergreen needles.

Field culture of tomatoes, A. GUY (*Prog. Agr. et Vit. (Éd. L'Est), 25 (1904), No. 4, pp. 113–118*).—An account is here given of the field culture of tomatoes in the southern part of France for the London market. Directions are included for handling the crop and shipping.

Watermelon growing, A. J. McCLATCHIE (*Arizona Sta. Bul. 47, pp. 302–307, fig. 1*).—Popular directions are given for the culture of watermelons in Arizona, special attention being given to varieties, irrigation, and cultivation. While all varieties of watermelons thrive in Arizona, the variety Augusta is considered most desirable as an early melon. Next in earliness is the Alabama. For the main crop the Florida and the Rattlesnake are most in favor. Sweetheart and Blue Gem are also grown to a considerable extent for the home market and for shipping. The Chilean is considered an excellent late melon.

Subirrigation in the greenhouse, W. M. MUNSON (*Amer. Agr., 73 (1904), No. 8, p. 201, fig. 1*).—Several methods of subirrigation in the greenhouse are described. In an experiment with radishes the percentage germination of the seed was about the same, whether subirrigation or surface irrigation was practiced. The yield, however, of first-class roots on the subwatered section was about 15 per cent greater than on the surface-watered section. In another experiment the number of marketable bunches obtained on the subwatered section was more than twice as great as the number obtained from the surface-watered section.

Principles of plant growth, A. T. ERWIN (*Trans. Iowa Hort. Soc., 38 (1903), pp. 233–236*).—Special attention is called in this article to the desirability of heading apple trees low in Iowa. With low-headed trees there is less sun scald, the trees do not dry out as much in winter, the wind can not get so great a leverage on them and thus blow them down, the fruit in falling is not bruised to so great an extent, spraying is more easily performed, and harvesting can be done much more rapidly and easier than where high heading is practiced. One of the disadvantages of low heading is the difficulty of cultivating close to the trees; but since with mature trees the feeding rootlets are at considerable distance from the trunk, it is believed that cultivation close to the body of the tree is not nearly as essential as it is generally thought to be.

An experiment was made in storing fruit by putting Wealthy and Wolf River apples in a cellar at harvesting time, and also storing in sheds. Those placed in the cellar decayed much more quickly than those put in sheds, owing to the fact that the cellar kept warm much longer than the shed above ground.

Production of new varieties, G. A. IVINS (*Trans. Iowa Hort. Soc., 38 (1903), pp. 345–348, pl. 1*).—The author gives an account of growing a large number of seedling strawberries, plums, apples, and grapes.

With strawberries the greatest success has been achieved in crossing on the Bubach variety. Two new varieties have been thus secured, one of which produces very large berries. The picking season of both continues about 3 weeks. They are staminate varieties and are considered good plant makers. A seedling of Beder Wood proved earlier, of better quality, higher color, and fully as productive as that variety. Another of Haverland proved more productive than the mother plant. Only one pistillate variety has been secured which is considered promising. It is a very large berry with nearly black foliage and has been named "Mary E."

The characteristics of a number of seedling apples which have been secured are noted in some detail. Some of these are of exceedingly fine quality and very hardy. The Rankin has been the best late fall apple grown by the author. The Hinkley is believed to be hardier than the Longfield. None of the author's seedling grapes have yet fruited.

A method of increasing the size of fruit (*Proskauer Obstbau-Ztg., 8 (1903), No. 6, p. 90*).—Directions are given for increasing the size of long-stemmed fruits such as apples, pears, etc., by grafting to the stem by approach a vigorous sprout growing near the fruit.

Origin of Black Ben Davis (*Nat. Nurseryman, 12 (1904), No. 2, pp. 18, 19*).—This is a report of a committee appointed by the Arkansas State Horticultural Society to investigate the origin of the Black Ben Davis. The committee stated that Black Ben Davis originated in Washington County, Arkansas, on a farm owned by Alexander Black; and that while it is of the Ben Davis type and has some of the characteristics of the apple known as Gano, it is a separate and distinct variety.

Thinning fruit, E. R. BENNETT (*Connecticut Storrs Sta. Rpt. 1903, pp. 28–32, fig. 1*).—A general discussion is given of the desirability of thinning different varieties of fruit, with an account of an experiment in thinning Baldwin apples. Five medium-sized trees were used in the experiment. On one tree about one-third of the fruit was removed, on another one-fourth, while on another the thinning was mostly done on heavy-laden limbs. Two trees were used as checks. In every case the thinning was done July 15, after the usual early dropping of the fruit was past.

The number of first and second grade fruits obtained and the total value of the fruit is recorded in a table. The increased value of the fruit due to thinning varied from 77½ cts. to $1.83 per tree. Thinning had a tendency to increase the size of the first-grade fruit; thus while it took 570 apples for a barrel of first-grade fruit in the case of the unthinned trees, it required but 536 to make a barrel of first-grade fruit from thinned trees. Suggestions are given on how to thin fruit and when to thin.

According to the author, peaches should be thinned to 6 or 8 in. apart. Plums should not be left close enough to touch each other when they are full grown. It is usually not desirable to thin until after the early periods of falling are past, which in the northern States occurs from the middle of June to the middle of July.

It is recommended that all discarded fruits be removed from the orchard and destroyed, either by burning or burying, as a means of controlling injurious insects and diseases.

Pruning of tree and bush fruits, W. N. HUTT (*Utah Sta. Bul. 83, pp. 33, figs. 28*).—Detailed directions are given for pruning all the more important orchard and small fruits, especial attention being given in each case to a discussion of the principles underlying the pruning operations to be performed with each fruit.

Pruning the peach, C. P. CLOSE (*Delaware Sta. Bul. 62, pp. 16, figs. 21*).—This bulletin discusses the value and best methods of pruning peaches in Delaware and is accompanied by a large number of photographs illustrating the text. Various subdivisions treat of the method of pruning roots at planting; pruning the top immediately after planting; pruning first, second, and subsequent years; renewing old orchards, etc. Low heading of peach trees is advocated.

Peach growing in Arkansas, E. WALKER (*Arkansas Sta. Bul. 79, pp. 43–68, dgm. 1*).—According to the author, peach growing is rapidly increasing in importance in Arkansas. The larger part of the orchards are located in the western half of the State on the higher grounds. The soils which are becoming popular for peaches are largely those which were coming to be considered "worn-out" cotton lands. Land so worn as to be unprofitable in cotton is giving very satisfactory results with peaches. Of the varieties grown throughout the State the medium and late ones are most profitable.

The early varieties come in competition with those from Georgia, Texas, and elsewhere, and are unprofitable. It is believed that Mountain Rose and Family Favorite

are as early varieties as will prove generally profitable in the State when planted in shipping quantities. The chief demand at the present time in Arkansas seems to be for yellow free-stone peaches. The varieties of peaches that have proved profitable for shipping are in order of commercial value Elberta, Salway, Mountain Rose, Emma, Family Favorite, and Heath Cling. Detailed directions are given for the location of peach orchards, and the planting, growing, harvesting, and marketing of the fruit.

Relative to the root pruning of young trees at transplanting, the author states that as a result of trials, close root pruning, such as is observed in the Stringfellow method, has proved less satisfactory at the station than planting with only moderate pruning of the roots.

A lesson in pollination, C. G. Patten (*Trans. Iowa Hort. Soc., 38 (1903), pp. 372–374*).—Pollen of Winter Nellis pears was put up by the author in California, shipped to Iowa, and used to fertilize blossoms of Keiffer pears about 30 days later. The pollen was spread out on unprinted paper as soon as gathered, and placed in a darkened corner of a room near a stove, where it was left until fully ripened and dried. This required about 35 hours. It was then placed in several envelopes to exclude the air, and shipped. The blossoms of the Keiffer pears fertilized with this pollen were the only ones that matured fruit on the tree during the season.

The Calimyrna fig, G. C. Roeding (*Pacific Rural Press, 67 (1904), No. 6, p. 84*).—The author states that the California crop of Calimyrna figs in 1903 was 65 tons. The cost of distributing Capri figs throughout the orchards for the purpose of pollinating the Smyrna figs was $1.15 per acre. The cost of drying and handling the Smyrna figs is stated to be considerably less than that required for Adriatic figs. The opening prices for dried Adriatics in 1903 was 3½ cts. per lb., while that for Calimyrna figs was 6 cts. per lb. The top grafting of California Adriatic figs with Smyrna varieties is recommended.

The date-palm orchard, R. H. Forbes (*Arizona Sta. Rpt. 1903, pp. 324–328, figs. 2*).—A further report of progress is given on the condition of the date-palm orchard up to July, 1903 (E. S. R., 14, p. 761). During the year the number of new suckers increased from 321 to 422, 60 trees blossomed, and the 4 varieties, Rhars, Deglet Noor, Amari, and Arechti fruited. The Rhars variety produced the bulk of the crop, which began to ripen August 30 and matured mostly between October 1 and 10. This appears to be a soft date of good flavor, but required drying to about 85 per cent of its original weight in order to keep and handle well. This may be done either artificially or in dry, quiet weather on the tree. It is now thought probable that the Deglet Noor variety will not ripen in the Salt River Valley.

The Amari variety has proved to be a small, dark date of very ordinary quality. About 60 per cent of the importations from Arabia and Beluchistan in June, 1902, have died and it is thought that about 10 per cent more will be lost. This heavy loss is believed to be due to the small size of the suckers imported. They averaged only 5 lbs. in weight, and it is believed that 30 lbs. is about the weight best suited for importation, combining economy in freight with a high-growing percentage.

In a summary of all the work thus far done at the station with imported dates, it is shown that 41 per cent of all the trees imported have been lost. Specimens of 68 varieties are now growing on the station grounds. The losses from a commercial point of view are heavy. On the basis of the station work it has cost, under favorable circumstances, not less than $4 each to deliver 25-lb. suckers from Africa to the station. On account of this excessive cost it is believed that many growers will prefer to plant seeds in the expectation of obtaining a small percentage of good fruit-bearing palms. Relative to the growing of palms from seed, the author states that "the seeds may be made to grow promptly by first stratifying them for 3 or 4 months. This consists in burying them under about 20 in. of well-drained moist sand or sandy soil, and keeping them moist for the time stated. They will then be

well softened and, being planted, will sprout promptly instead of waiting weeks or months before appearing above ground. Very alkaline ground should not be used to start seedlings, which are much less resistant to salts than mature trees."

Strawberry culture, A. J. McClatchie (*Arizona Sta. Bul. 47, pp. 297–299*).—Popular directions are given for the culture of strawberries in Arizona. The 2 most commonly cultivated varieties in Arizona are the Arizona Ever-Bearing and Michel Early. The Ever-Bearing gives the better results on heavy soils, while the Michel is better adapted for more sandy soils. The Michel is the earlier berry of the two, and endures heat and drought better.

The native shrubs of Iowa, B. Shimek (*Trans. Iowa Hort. Soc., 38 (1903), pp. 453–468, pls. 10*).—A botanical key is given for identifying the native shrubs of Iowa, and in addition descriptive notes on 97 of these shrubs. Plate illustrations are also given in a number of instances.

Beautifying the home grounds, L. C. Corbett (*U. S. Dept. Agr., Farmers' Bul. 185, pp. 24, figs. 8*).—Directions are given for the laying out and the beautifying of home grounds by the use of shrubs, flowers, vines, and trees. Cultural suggestions are given, as well as directions and diagrams for the planting of various shrubs in groups. Some notes are also given on planting to produce immediate effects and on the maintenance of lawns.

Roses and their cultivation, T. W. Sanders (*London: W. H. & L. Collingridge, 1904, pp. 162, figs. 59; rev. in British Med. Jour., 1904, No. 2254, p. 611*).—This purports to be a full account of English methods of growing and managing roses, with descriptions of varieties and other matter of interest to rose growers.

Comparative fertilizer experiment with the commercial fertilizer "Heureka" and the Wagner fertilizer "WG" with pelargoniums and fuchsias, R. Otto (*Gartenflora, 53 (1904), No. 3, pp. 58–61*).—The details are here given of a test to compare the relative values of these two commercial fertilizers in the pot culture of pelargoniums and fuchsias. The "Heureka" fertilizer was supposed to contain 7 to 10 per cent of nitrogen, 7 to 10 per cent of phosphoric acid, and 7 to 10 per cent of potash; all in an easily assimilable form. The fertilizer "WG" was supposed to contain 13 per cent of nitrogen, 13 per cent of phosphoric acid (12 per cent of which was water soluble), and 11 per cent of potash.

With pelargoniums the "Heureka" fertilizer proved much the better of the two. The leaves of the plants fertilized with this material were larger, deeper green, earlier, more numerous, and the flowers were more highly colored than where the fertilizer "WG" was used. With fuchsias, however, the results were considerably in favor of the "WG" fertilizer. All in all, the author considers that these two fertilizers stand very close to each other as regards their relative value in garden and flower culture.

FORESTRY.

Tests of forest trees, A. Dickens and G. O. Greene (*Kansas Sta. Bul. 120, pp. 85–131, pls. 12*).—Tests of forest trees were among the first experiments begun at the Kansas Agricultural College, and an account is given of a number of the plantings which took place between 1886 and the present date. The different species planted are described at some length, their adaptability to conditions and rate of growth being indicated. Among the trees reported upon are ash, black walnut, Osage orange, ailanthus, various maples, box elder, cottonwoods and poplars, elms, oaks, and various conifers.

In 1896 a cooperative experiment with the Bureau of Forestry of this Department was begun to test the hardiness of tree seedlings. Seeds from different localities were sown and observations made to test their resistance to the climatic conditions of the station. While considerable difference was noted in the individual trees, there was nothing to indicate great differences in species received from different States.

A second report is given of cooperative tree planting carried out in 1896-7, the rate of growth of the different trees being shown. The species in this experiment were aspens, red cedars, and various pines.

Planting trees for posts, fuel, and wind-breaks, O. M. MORRIS (*Oklahoma Sta. Bul. 60, pp. 19, figs. 6*).—Directions are given for the collection of seed, propagation and care of seedlings, cultivation in the nursery, preparation of the land, and transplanting of trees for the different purposes indicated in the title. The first tree planting made at the station was begun in 1898. A brief account is given of the different species of trees planted, and a report is made of those still living in December, 1903. The adaptability of a number of species for planting in Oklahoma is described, including the American white ash, box elder, catalpa, white elm, hackberry, black locust, honey locust, soft maple, Osage orange, Russian mulberry, sycamore, and black walnut.

The measurement of saw logs, A. L. DANIELS (*Vermont Sta. Bul. 102, pp. 35-40, charts 2*).—The author gives a formula for determining the actual number of board feet in the average log, and compares the results obtained by this system of measurement with the log rules in common use. There seems to be good reason for believing that this rule, which is designated as the "Universal log rule," offers distinct advantages over any of the others now in use.

Some of the sources of error of other rules are pointed out and comparisons made between the estimated contents of the log and the actual amount as shown by the sawed lumber. The universal rule, which can be used for logs of any size, is as follows: From five-eighths of the diameter in inches subtract 2 and multiply by the diameter. The error in this rule, so far as tested, is only about 1 part in 200.

SEEDS—WEEDS.

Clover and alfalfa seeds, A. D. SELBY and J. F. HICKS (*Ohio Sta. Bul. 142, pp. 111–130, pls. 4*).—The results of examination of 28 samples of red clover seed, 15 of alfalfa, 6 of alsike clover, and 3 of crimson clover. Attention is called to certain impurities which were found in many of the samples, the presence of dodder in red clover and alfalfa being especially commented upon.

The detailed results of the examinations of the different lots are given in tabular form, and the presence of foreign seeds in the different samples is indicated. The vitality tests showed that the seed for the most part was of fairly good quality, but wide differences were noted between soil tests and those conducted in a seed-testing apparatus. In order to remove the danger from the introduction of dodder, the authors recommend that no alfalfa seed be sown until it has been thoroughly screened through a sieve of 20 meshes to the inch to remove the dodder seeds.

Some weeds of Iowa, L. H. PAMMEL (*Iowa Sta. Bul. 70, pp. 295–545, figs. 169*).—This is a more technical and expanded edition than the popular edition previously noted (E. S. R., 15, p. 372). The information regarding the different weeds is given in greater detail, and comprehensive accounts are included of the distribution and migration of weeds, and the means of dissemination of plants. A number of poisonous plants are described at length, particular attention being paid to poisoning from cowbane (*Cicuta maculata*). The effect of weeds on crops, their duration, and the different species of weeds which are associated with different crops are discussed.

Weeds used in medicine, ALICE HENKEL (*U. S. Dept. Agr., Farmers' Bul. 188, pp. 45, figs. 31*).—A popular bulletin describing the methods of collecting and curing drugs, roots, barks, etc., and giving suggestions for their disposal. A number of species of plants which occur more or less as weeds are described, and their utilization by preparing them for the drug trade is suggested.

Weed prevention experiments, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 63 (1902), pp. 359–361*).—A report is given of experiments carried on for the eradica-

tion of wild poppy, wild oats, wild onion, and the annual chrysanthemum. In the experiments for wild poppy eradication, spraying with copper-sulphate solutions was again tried. Shortly before the poppies came into flower they were sprayed with a 2 per cent solution. In one case the solution was distributed over the upper side of the leaves, while in the second an attempt was made to thoroughly spray it on the under side of the foliage. When copper-sulphate solution was applied so as to well cover the under side of the leaves the plants were to a great extent destroyed.

The experiments for wild oats eradication consisted of a top-dressing of nitrate of soda and sulphate of ammonia. In 1901 the effects of basic slag and lime were tried, the wild oats being sown with barley. The slag did not seem to produce any benefit, but with the application of lime there was a marked reduction in the wild oats and an accompanying increase in the barley crop.

For the eradication of the wild onion a 5 per cent solution of carbolic acid was tested with promising results. In the experiments for the eradication of the annual chrysanthemum, the application of lime was tested at the rate of 2 tons per acre. The application was followed by a decided reduction in the amount of wild chrysanthemums present, but the results were not sufficiently marked to lead to the conclusion that a single application of lime at the rate indicated would be sufficient for the eradication of this weed.

DISEASES OF PLANTS.

A few common plant diseases in Delaware, C. O. Smith (*Delaware Sta. Bul. 63, pp. 19–28, pls. 3, fig. 1*).—Notes are given on corn blight, Lima bean mildew, bean anthracnose, and bean and watermelon anthracnose. During 1903 many complaints were received at the station regarding the blighting of corn. Investigation showed that the trouble was due to the fungus *Helminthosporium inconspicuum*, which produces discolored elongated spots on the leaves, the width often being limited by the veins of the leaf. The fungus makes its appearance ordinarily during July and August, and thus far has not been reported as injuring corn seedlings. The spore characters and germination are described, and the results of some artificial infection experiments are given.

In many respects this disease is said to resemble a destructive disease of maize in southern Europe, which is attributed to *H. turcicum*, and the 2 organisms are described as probably identical. As this disease occurs upon the corn in an advanced stage of growth there appears to be no practical remedy for its prevention. Rotation of crops is recommended, and as it is probable that spores would live after passing through the alimentary canal of animals, the use of manure from corn-fed animals on land intended for corn is cautioned against.

The mildew of Lima beans due to *Phytophthora phaseoli* is described. This disease seems to be entirely confined to the Lima bean, and has been the subject of considerable investigation at different stations. Hitherto the fungus has not appeared in sufficient abundance to be very troublesome, but a warning is given for the protection of fields in case of a wet summer and fall.

The bean anthracnose (*Colletotrichum lindemuthianum*) is described, the spore characteristics, mycelium, etc., being characterized. On account of various experiments which have been carried on to prove the identity of similar diseases, the author gives an account of inoculation experiments between the species of Colletotrichum growing on the bean and watermelon. These inoculations were made with spores on cucumber, pumpkin, squash, muskmelon, watermelon, and bean, and while the results are not considered conclusive, the failure to produce the disease leads the author to believe that the two fungi are distinct, *C. lindemuthianum* growing on the bean and *C. lagenarium* upon the cucurbits. For the prevention of this disease spraying with Bordeaux mixture has given satisfactory results.

Treatment of certain plant diseases, F. D. CHESTER (*Delaware Sta. Bul. 63, pp. 29–32*).—A brief report is given of experiments in spraying grapes, treating asparagus rust, and plum rot.

The experiments in spraying grapes were conducted to test the effect of different applications of Bordeaux mixture, and the relative value of Bordeaux mixture with and without the addition of resin soap. The different rows of vines were given 1 to 4 sprayings of the different fungicides. Two sprayings gave nearly as good results as 4 sprayings and at half the cost. The yield was approximately doubled as the result of the first 2 sprayings, and no special advantage would be gained by further sprayings in the average seasons, but the persistence of warm, damp weather would justify a third application 2 weeks after the second.

While the results did not show that the addition of the resin soap offered any advantage over the use of plain Bordeaux mixture, it is thought to make the spray finer and cause a more even distribution of the fungicide. Certain plants, as asparagus and plum, seem to require the addition of soap to cause a proper spread of the fungicide. On this account the author describes the method of preparing resin soap, which consists in heating 35 gal. of water and 42 lbs. of sal soda to the boiling point in a water-tight barrel by means of steam until the soda is dissolved, adding 60 lbs. of melted resin, and continuing the boiling for an hour or two, until a homogeneous mixture is obtained. Two quarts of this mixture are to be used with each barrel of Bordeaux or other fungicide. Where steam is not available, the boiling may be carried on in a kettle or boiler over a fire.

An account is given of spraying experiments for the treatment of asparagus rust, which demonstrate that the disease can be controlled by the use of Bordeaux-resin-soap mixture. The first application should be made about the 1st of July and followed by a second early in August. Ordinarily these 2 sprayings will carry the plants over without injury to the next year's crop.

In experiments in the treatment of plum rot the Bordeaux-resin-soap mixture was tested with fairly satisfactory results. So long, however, as mummy fruits are allowed to remain on the trees but little benefit will be derived from the spraying. The author recommends the removal of all such sources of infection, and winter spraying with strong copper-sulphate solution, followed by sprayings during the season as required.

Some experiments with fungus diseases in 1903, L. F. HENDERSON (*Idaho Sta. Bul. 39, pp. 257–272*).—The 3 most serious diseases of fruits in the vicinity of the Idaho Station are said to be the fire blight of the pear, apple scab, and powdery mildew of the gooseberry. During 1903 experiments were conducted to test the efficiency of a gasoline spraying engine, the value of 2 sprayings of Bordeaux mixture for the prevention of apple scab, the efficiency of potassium sulphid in preventing gooseberry mildew, and pruning for the fire blight of the pear.

The gasoline engine was not found to be wholly satisfactory, due partly to the steep hillside of the orchard, certain mechanical difficulties, and the cost of the machine. Where the land is not too steep and competent help is at hand for running the engine, which is kept in good condition, the cost of the machine should not be considered as it is said to effect a great saving in manual labor, being more powerful and rendering a finer spray, with less liability of the fungicide to clog the nozzle. It is thought doubtful whether a gasoline spraying engine would prove a success in the majority of the orchards in the Palouse country.

Experiments for the prevention of gooseberry mildew were carried on with 3 or 4 applications of sodium sulphid of 2 strengths, 1 oz. and one-half oz. per gallon of water. The results obtained show conclusively the efficiency of protecting fruit against the mildew by this treatment, although the tips of some of the young shoots at the end of the season showed the presence of the fungus. In order to stamp out the disease the spraying should be continued late into the summer.

The experiments for the prevention of apple scab were carried on in 2 orchards, the fungicide used being Bordeaux mixture, but the almost entire absence of scab from the unsprayed trees led to rather negative results. It is thought that the pruning and cleaning up of the orchards and their thorough cultivation aided very materially in suppressing the apple scab. The use of lime-sulphur spray for apple scab was tested, and it was found that a single application of this fungicide would not prevent the occurrence of the disease, although such a claim has been made for it.

A brief account is given of the pruning of pear trees for the destruction of the fire blight. The trees in question were severely pruned during the early summer, and although the variety Winter Nellis is particularly subject to the disease, the trees examined in October did not show a trace of the blight either on the fruit, young branches, shoots, or leaves.

Crown gall, W. PADDOCK (*Colorado Sta. Bul. 86, pp. 7, pls. 3*).—A popular account is given of the crown gall of fruit trees and other plants, and a warning against its spread from infested nurseries. In Colorado the disease does not seem to be particularly destructive where irrigation is not practiced, but its abundance in other districts is shown by the fact that few shipments of nursery stock have been received from points outside of the State which were entirely free from the disease. The preventive measures of inspection, rejection of affected stock, pruning of diseased portions of old trees, and covering them with the fungicide are described.

ENTOMOLOGY.

Thirty-fourth annual report of the Entomological Society of Ontario, 1903 (*Rpt. Ontario Ent. Soc. 1903, pp. 116, pls. 5, figs. 60*).—This report contains the proceedings of the fortieth annual meeting of the society, held at Ottawa September 3 and 4, 1903. During the different sessions of the society various papers on economic entomology were presented, some of which are briefly mentioned in the following notes:

Reports were made to the society by the Entomological Council and by its various branches and sections, and brief accounts were given on the insects of the year by C. H. Young, C. E. Grant, and J. A. Balkwill. The president, W. Lochhead, in his annual address (pp. 22–26) discussed the progress of economic entomology in Ontario. The subject was presented in a historical manner and notes were given on the economic entomological investigations of greatest importance.

A paper on the transmission of yellow fever by mosquitoes was read by L. O. Howard (pp. 26–30). W. Lochhead (pp. 31–36) gave an account of the injurious insects of the season, including Hessian fly, wheat midge, pea weevil, codling moth, beet leaf miner, plum curculio, tussock moth, gooseberry fruit worm, asparagus beetles, etc. Some notes on various injurious insects were given by C. Stephenson and A. H. Kilman. The habits and life history of the cottony maple scale were described by C. J. S. Bethune (pp. 40–42), and the same author discussed the economic relations of the great leopard moth (pp. 46, 47). A key to the insects affecting small fruits (pp. 74–79) was given by the same author, who also discussed the present condition of the San José scale in Ontario (pp. 42–45). In the last-named paper notes are given on the use of crude petroleum, whale-oil soap solution, carbolic wash, and lime-sulphur-salt wash.

The insects injurious to linden were discussed by A. Gibson (pp. 50–61). The pests of this tree were classified according to the particular part of the tree affected and according to their systematic position.

J. Fletcher presented a general account of insects injurious to Ontario crops in 1903 (pp. 62–71). In this paper notes were given on wheat-stem maggot, fall webworm, Hessian fly, clover-seed midge, white grub, onion maggots, carrot rust fly, asparagus beetles, cucumber beetles, San José scale, etc.

Report of the government entomologist, C. Fuller (*Natal Agr. Dept. Rpt. 1902, pp. 53-58*).—A general account of the author's work during the year 1902. Notes are given on the distribution of locusts in various parts of Natal and on the work of the agricultural department in destroying these pests. The Government furnishes free of charge arsenic, soda, and sugar for the preparation of poison baits in the destruction of locusts.

Report on the injurious insects and other animals observed in the Midland Counties during 1903, W. E. Collinge (*Birmingham: Cornish Bros., Ltd., 1904, pp. 16, figs. 16*).—Brief descriptive biological and economic notes are given on the red spider, currant gall mite, myriapods, woolly aphis, plum aphis, flour beetles, pear midge, carrot rust fly, onion maggot, cabbage maggot, diamond-back moth, gooseberry sawfly, *Limax agrestis*, etc.

A report on the injurious insects for 1902, C. Schröder (*Allg. Ztschr. Ent., 8 (1903), No. 1, pp. 9-11*).—Economic and biological notes on cutworms, frit fly, nematodes, pear-leaf blister mite, *Anthomyia funesta*, etc.

The migration and dispersal of insects, J. W. Tutt (*London: Elliot Stock, 1902, pp. 132*).—The author presents in a systematic manner the facts which have been recorded in entomological writings regarding the causes and conditions of the migration of various species of insects.

Recent practical entomological literature, A. Tullgren (*Ent. Tidskr., 24 (1903), No. 4, pp. 233-245*).—The author briefly summarizes the results announced in recent literature concerning methods of spraying and insects injurious to fruits, garden vegetables, field crops, and ornamental trees.

Statistical data concerning the causes of white-head condition in grasses in Finland, E. Reuter (*Ent. Tidskr., 24 (1903), No. 2-3, pp. 113-125*).—The disease known as white head in grasses was carefully studied in various parts of Finland, for the purpose of arriving at a conclusion regarding the insects which were most concerned in producing this condition. The statistics which are reported by the author were collected during the years 1889 to 1901 and indicate that the pests chiefly concerned in bringing about white head are the following: *Pediculoides graminum*, *Tarsonemus culmicolus*, *Aptinothrips rufa*, *Eriophyes cornutus*, etc.

Descriptions of some new species and varieties of Canadian butterflies, J. Fletcher (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 9 (1903-4), Sec. IV, pp. 207-216, pl. 1, figs. 2*).—Descriptive and economic notes are given on a number of butterflies of Canada described as new under the following names: *Phyciodes hanhami*, *Thecla strigosa liparops*, *T. heathii*, *Lycæna pseudargiolus argentata*, *L. pseudargiolus nigrescens*, and *Pamphila manitoboides*.

Diffusion of the hawk moths in North America, F. M. Webster (*Canad. Ent., 36 (1904), No. 3, pp. 65-69, fig. 1*).—According to the author, the majority of North American species belonging to this family appear to have migrated northward from Mexico and the Antilles into various parts of the United States, especially along the Atlantic and Pacific coasts.

Precocious development of the pupal and adult organs in the larvæ of Lepidoptera and Coleoptera, H. J. Kolbe (*Allg. Ztschr. Ent., 8 (1903), Nos. 1, pp. 1-9; 2-3, pp. 25-30, figs. 12*).—The precocious development of various insect organs were studied with special reference to the histology of these structures. Particular attention is given to a study of these questions in the case of *Dendrolimus pini*, which is injurious to pine trees.

A revision of the Nearctic Chrysopidæ, N. Banks (*Trans. Amer. Ent. Soc., 29 (1903), No. 2, pp. 137-162, pl. 1*).—A brief account is given of the habits, life history, and economic importance of these insects. The greater part of the article is occupied with a detailed account of the various species of this family which occur in North America. Several of these species are described as new. A bibliography of the subject is appended to the article.

A revision of the Anophelinæ, G. M. GILES (*London: John Bale Sons & Danielsson, Ltd., 1904, pp. 47, pl. 1, figs. 13*).—This constitutes the author's first supplement to the second edition of his Handbook of the Gnats. Notes are given on the names, habits, and life history of a number of species in the subfamily Anophelinæ, and descriptions are presented of several new species.

The cotton bollworm, A. L. QUAINTANCE (*U. S. Dept. Agr., Farmers' Bul. 191, pp. 24, figs. 7*).—A brief historical statement is given regarding the previous investigations referring to this insect. It appears that planters have thus far made little practical use of the effective remedies which have been discovered. Notes are given on the extent of injury from this insect in Texas in 1903, and also upon its general distribution, habits, life history, food plants, etc. The number of annual broods appears to vary from 4 to 7, with an average of about 5. The preferred food plant is corn, but no practical remedies have been devised for combating the insect upon this plant. The chief injury to cotton from the bollworm appears with the August brood of caterpillars. Observations on the egg-laying habits of the moths showed that the majority of eggs are deposited upon the leaves. The effect of infestation of the squares is to cause them to flare.

Among the ineffective remedies which have been tried or recommended the author mentions trap lanterns, poisoned sweets, burning of sulphur, and the use of resistant varieties. No varieties of cotton immune to attacks by the bollworm are known. During the season of 1903 experiments were made in early planting, spraying with arsenicals, and using corn as a trap crop. As the result of these experiments it is recommended that an early variety of cotton be used, and that this be planted as early in the spring as possible and given good cultivation. Corn may be advantageously used as a trap crop provided it is planted so as to be in silk not later than August 1. Considerable benefit may be obtained from spraying with arsenicals, which are most effective if applied about August 1. The arsenicals may be applied dry or in water, but from the standpoint of convenience the dusting method is preferred.

Information concerning the Mexican cotton-boll weevil, W. D. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 189, pp. 31, figs. 8*).—In this bulletin a historical account is presented of the introduction and distribution of this pest in the United States, with a special account of the territory infested at present, the amount of damage, and a plan of the investigations of the Division of Entomology. Notes are given on the life history and habits of the insects, and on local restrictions regarding the shipment of infested cotton seed in Alabama, Georgia, North Carolina, Mississippi, and Louisiana. The author states that certain dealers have raised the price of cotton seed alleged to be of northern origin far beyond the actual value of the seed, and in some cases when the seed concerned was not of northern origin.

As a result of the investigations thus far made in combating this insect, it is concluded "that there is not even a remote probability that the boll weevil will ever be exterminated." The belief is expressed, however, that the insect can be sufficiently controlled to allow the production of profitable crops by practicing a number of preventive measures, such as early planting, the use of seed of early varieties, thorough cultivation of the fields, planting the rows far apart, destroying all the cotton stalks in the fields when the weevils become so numerous that all the fruit is being punctured, and more extensive use of fertilizers.

Sesamia fusca (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 220–222, pl. 1*).—The life history and habits of this insect are briefly discussed. Some damage is done to corn wherever the insect is found. The best methods for controlling the pest consist in the proper rotation of crops, late planting, fall plowing, and burning of corn stubble.

The climbing cutworm in the Hawkesbury District, H. W. POTTS (*Agr. Gaz. New South Wales, 14 (1903), No. 12, pp. 1203–1206, figs. 4*).—The climbing cutworm is reported as having caused great injury to wheat fields during the past season. The

leaves and heads in infested fields were entirely destroyed. The best results in combating the pest were obtained from the use of brush harrows and ditches about 9 in. deep provided with deeper holes at intervals of 10 yds.

Cankerworms in Ohio, A. F. Burgess (*Ohio Dept. Agr., Div. Nursery and Orchard Inspection Bul. 2, pp. 13, figs. 7*).—Notes are given on the habits, life history, and distribution in Ohio of the fall and spring cankerworms. Attention is called to the influence of unfavorable weather conditions upon the prevalence and distribution of the insect, and brief notes are given on the natural enemies of the cankerworm and on artificial remedies, such as banding the trees and spraying with arsenicals.

Insects injurious to the apple, G. H. French (*Trans. Illinois Hort. Soc., n. ser., 37 (1903), pp. 530–535*).—The author discusses briefly the habits, life history, and means of combating codling moth, flat-headed apple-tree borer, and scale insects.

The curculio and the apple, C. S. Crandall (*Trans. Illinois Hort. Soc., n. ser., 37 (1903), pp. 176–189*).—The injuries of the plum curculio, apple curculio, and plum gouger are briefly described. Spraying experiments were made, during which applications of standard Bordeaux mixture and Paris green were given to apple trees at 3 periods, viz, when the buds were bursting, just after the petals had fallen, and 1 week later. The results indicated that the injury from the plum and apple curculios is considerably reduced by this treatment. Notes are also given on the habits and life history of these insects.

The ribbed cocoon maker of the apple, M. V. Slingerland and Philena B. Fletcher (*New York Cornell Sta. Bul. 214, pp. 69–78, pls. 4, figs. 3*).—This is a new name proposed by the authors in place of the one which has hitherto been in use, viz, apple bucculatrix. The pest is apparently increasing in number in New York orchards. Descriptive notes are given on the cocoons, caterpillars, and adult insects. The moths of the first brood emerge about the middle of May. They seldom fly except when disturbed. The number of eggs deposited by each female is 4 or 5, and they hatch within from 6 to 10 days. A gradual migration of caterpillars takes place from the upper to the lower branches. In the southern part of New York there are 2 broods per year. The apple appears to be the preferred food plant. Pear, plum, peach, and cherry trees seem to be immune. A number of parasitic insects are mentioned as assisting in the control of this pest, which is also attacked by birds and spiders. There is a large mortality of the pupæ during the winter. In experiments with remedies it was found that the pupæ of this pest could be killed by spraying with whale-oil soap at the rate of 1 lb. per gallon of water. Good results were also obtained by the use of lime-sulphur-salt and mechanical mixtures of kerosene and water.

The peach-tree borer, F. Sherman, Jr. (*North Carolina Dept. Agr., Ent. Circ. 7, pp. 5, fig. 1*).—Brief notes are given on the habits and life history of this insect, together with recommendations concerning the most promising methods of combating it.

The Coccidæ of Ceylon, III, E. E. Green (*London: Dulau & Co., 1904, pp. 171–249, pls. 33*).—In this part of the author's monograph of the Coccidæ of Ceylon the subfamily Lecaniinæ is considered. A synopsis is given of the various genera belonging to this subfamily, and detailed descriptive notes are presented on 33 species of Lecanium.

Treatment of the San José scale in cities, A. F. Burgess (*Ohio Dept. Agr., Div. Nursery and Orchard Inspection Bul. 1, pp. 8, pl. 1, fig. 1*).—Brief descriptive notes on the San José scale, together with an account of its life history, distribution in Ohio, natural enemies, and food plants. Formulas are presented for preparing the insecticides most commonly used in destroying this pest.

A new method of destroying the woolly aphis, E. André (*Rev. Hort. [Paris], 76 (1904), No. 4, pp. 83, 84*).—In an orchard infested with the woolly aphis it was noticed that trees in close proximity to walnut trees were comparatively immune.

Experiments were made to test the possible action of the active principle of walnut trees in the control of these insects. Good results were obtained from pouring a decoction of the leaves of *Juglans regia* upon the woolly aphis and in the soil about the roots of infested trees.

The destruction of grapevine flea-beetles, J. Bonhomme (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 1, pp. 15, 16*).—According to experiments reported in this paper grapevine flea-beetles may be quite successfully controlled by infection with *Botrytis bassiana.* Cultures of this fungus were distributed on leaves upon which the larvæ were feeding. Upon examination of the larvæ later it was found that the spores eaten by them had germinated and caused death by gradual infection of all the internal organs.

A new organ in Phylloxera vastatrix, H. Stauffacher (*Allg. Ztschr. Ent., 8 (1903), Nos. 2–3, pp. 30–35; 4, pp. 57–60, pl. 1, figs. 4*).—In studying the anatomy of this insect the author discovered a new organ on the ventral side of the body between the first and second thoracic segments. The organ is paired and is believed to be the organ of hearing. The gross and microscopic anatomy of this structure is described in detail.

Extensive outbreaks of Lymantria monacha during the years 1898-1902, J. Meves (*Ent. Tidskr., 24 (1903), No. 4, pp. 225–229*).—Detailed notes are given on the occurrence of this insect in various parts of Sweden during the past 4 years. In forests composed of large trees there is no practical means of combating the insect, except by felling and removing infested trees. Eradication may be somewhat assisted by infectious diseases. Vigorous trees under 3 years of age are rarely attacked. In cases where the insect is present only in small numbers the outbreak may be checked to a considerable extent by collecting the eggs and destroying the moths.

Lasiocampa pini as a forest insect, J. Meves (*Ent. Tidskr., 24 (1903), No. 1, pp. 61–64, pl. 1*).—The habits and life history of this insect are briefly mentioned with special reference to suitable means of combating it. The insect attacks pine and spruce trees of all ages. Experiments showed that the larvæ were capable of withstanding a temperature of —10° C., and it is believed that the pest winters over to a considerable extent in the larval condition.

Studies of the life history, habits, and taxonomic relations of a new species of Oberea (O. ulmicola), F. M. Webster (*Bul. Illinois State Lab. Nat. Hist., 7 (1904), Art. 1, pp. 1–14, pls. 2*).—This species has thus far been found only in a single town in Illinois, where it appears to be confined to one section of the city. The technical description of the species is given by F. H. Chittenden, and the account of the habits and life history is largely based on observations by E. S. G. Titus.

The insect appears to be confined in its feeding habits to the American elm. There is only 1 generation annually, and the larvæ hibernate in the twigs. The pupal period occupies from 22 to 29 days. The eggs are deposited from May 20 to June 15. The effect of the attack of this insect upon elms is to cause the development of clusters of small twigs upon the sides of the branches, and to bring about the premature falling of the leaves.

The method by which young willows protect themselves against the attacks of Dichelomyia rosaria, P. Speiser (*Allg. Ztschr. Ent., 8 (1903), No. 10–11, pp. 204–206, fig. 1*).—In studying willows attacked by this gall-forming insect, the author found that affected branches grew downward in a spiral manner, and that the growth of the affected twig was continued by means of the rapid development of the bud lying immediately below the affected one.

Galls on Abies pectinata, K. Escherich and E. Wimmer (*Allg. Ztschr. Ent., 8 (1903), No. 6–7, pp. 119–122, figs. 4*).—A detailed description is given of the galls on the needles of this tree which are due to the attacks of a species of Lestodiplosis.

Pulex vagabunda, E. Wahlgren (*Ent. Tidskr., 24 (1903), No. 2–3, p. 219*).—Brief

descriptive and economic notes are given on this species, which is said by the author to be referable to the genus Ceratophyllus.

Plant-house Aleurodes, L. R. Cary (*Maine Sta. Bul. 96, pp. 125–144, figs. 11*).—A description is presented of the embryonic stages of this insect, and notes are given on the anatomy of the adult form. Hydrocyanic-acid gas was found to be a successful remedy for combating this species in greenhouses.

The red spider, A. Tullgren (*Ent. Tidskr., 24 (1903), No. 4, pp. 246–249*).—The habits and life history of this pest are briefly described, and notes are given on the use of various insecticides in controlling it. These insecticides include sulphur, potassium sulphid, kerosene emulsion, lysol, antinonnin, and decoction of tomato leaves.

Studies of the habits and development of Neocerata rhodophaga, F. M. Webster (*Bul. Illinois State Lab. Nat. Hist., 7 (1904), Art. 2, pp. 15–25, pl. 1*).—This insect was reported as injuring roses under glass in the vicinity of Chicago. The pest appears to prefer the Meteor rose, but attacks also other varieties, especially Wooton, Bride, Madame Chatenay, etc. No injury is done in rose houses between November and May. The habits of the insect are not well understood. It seems not to attack native species of wild roses, and is therefore considered not to be a native species of insect. The author is not certain whether the name as provisionally adopted for the species will prove to be the correct one.

Spraying apples and pears, F. Sherman, Jr. (*North Carolina Dept. Agr., Ent. Circ. 6, pp. 7*).—As the result of observation of orchards in North Carolina and correspondence with orchardists, it is concluded that careful and persistent spraying of apple and pear trees with Bordeaux mixture and Paris green furnishes the most effective means of restoring the orchards of the State to a productive condition. Notes are given on the insect pests and fungus diseases which may be controlled by these remedies, and also on the manner of preparation and methods and time of application of the remedies.

A supposed remedy for fruit-tree pests: Gunpowder, sulphur, niter, sulphate of iron, mixed and inserted into the tree, C. T. Musson (*Agr. Gaz. New South Wales, 14 (1903), No. 12, pp. 1206, 1207*).—These substances were mixed in equal quantities, and an ounce of the mixture was inserted in holes ¾ in. in diameter bored into trees at a height of 2 ft. from the ground. An application was made upon wattle and plum trees. The holes were blocked with clay. After a period of 6 months there was no evidence that this remedy had had any effect upon the insect pests of these trees.

The nurseries inspection and quarantine bill, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 24 (1904), No. 2, pp. 188–195*).—The author gives the text of a quarantine bill which has been under consideration for a number of years. It is believed that the bill will be introduced into the colonial parliament during the coming season, and on this account the author urges the desirability of such a law in order to protect the nurserymen and fruit growers of South Africa.

The Columbacs fly, L. von Aigner-Abafi (*Allg. Ztschr. Ent., 8 (1903), Nos. 5, pp. 93–96; 6–7, pp. 124–127*).—The habits and life history of this species of fly are described in detail. The fly belongs to the family Tipulidæ and is generally distributed in southeastern Europe. The females lay from 5,000 to 10,000 minute eggs in running water. The larvæ require from 6 to 8 weeks for development.

The adult insects appear in swarms and attack cattle, horses, sheep, and hogs, which animals are frequently killed by the flies. The losses of live stock are especially serious in parts of Servia and Hungary. In animals which are not killed outright by the attacks of the flies a fever and other abnormal conditions are produced. In protecting animals against this pest the author recommends that animals should be allowed to graze only between sunset and sunrise, and that smudges or substances giving off disagreeable odors be maintained in connection with the stables. Ani-

mals may be protected to some extent from the bites of the flies by covering them with rank smelling oils, etc.

Ten generations of the house fly under different conditions, E. A. Bogdanow (*Allg. Ztschr. Ent., 8 (1903), No. 14–15, pp. 265–267*).—In one series of experiments the wings of the common house fly were clipped for a series of 10 generations in order to determine the effect of this operation upon the flies. No permanent effect was produced by clipping the wings. In a second series of experiments flies were maintained for 10 generations with no food except meat mixed with increasing quantities of the flowers of tansy. No effect was produced by this unusual food.

Mosquitoes, C. Fuller (*Natal. Agr. Jour. and Min. Rec., 7 (1904), No. 1, pp. 50–56, figs. 7*).—A brief account of the habits, life history, and means of combating these pests. The use of permanganate of potash in infested pools and growing eucalyptus trees for the purpose of keeping away mosquitoes are condemned as absolutely valueless. The usual remedies, such as covering the pools with kerosene and draining stagnant water, are recommended.

Termites and termitophilous insects of Central America, F. Silvestri (*Redia, 1 (1903), No. 1, pp. 1–234, pls. 6, figs. 57*).—A detailed technical description is given of the various species of white ants known to occur in Central America. The author also describes the habits of these insects and presents a discussion of the biology of the various members of the colonies of white ants, the duration of the life of individuals, feeding habits, nests, and the relationship of white ants to agriculture. As a rule these species are injurious only to dead trees or timber, but sometimes attack living trees.

In the second part of the author's article notes are given on the various species of mites, scale insects, flies, beetles, Hemiptera, etc., which are known to inhabit the nests of white ants.

Sex determination in bees and ants, W. E. Castle (*Science, n. ser., 19 (1904), No. 479, pp. 389–392*).—A brief popular account of the theories concerning parthenogenesis in bees, in which the author supports the theory of Dzierzon.

Bee keeping, F. Sworder (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 139–148, pls. 4*).—Various forms of comb foundation are described and notes are given on the methods of preventing the falling of brood comb in young swarms. The author also discusses in a brief manner the location and general management of apiaries, hives, section honey, and the most suitable methods for hiving bees.

Bees and their benefit to the farmer, J. D. Pike (*Ohio State Bd. Agr. Rpt. 1902, pp. 506–509*).—A general account is given of the problems concerned in apiculture with special reference to the importance of bees in fertilizing fruits.

Apiculture in Italy (*Ann. R. Scuola Superiore Agr. Portici, 2. ser., 3 (1902), pp. 691–702*).—A brief statistical account is presented of the quantity of honey produced in various parts of Italy and of the import and export trade in this product. Attention is called to the importance of apiculture, and especially to the agency of bees in the fertilization of fruit trees.

Studies and observations on bumblebees, S. Bengtsson (*Ark. Zool., 1 (1903), No. 1–2, pp. 197–222*).—The author reports the results of his observations on the habits and life history of bumblebees, with special reference to the species *Bombus distinguendus* and *B. hypnorum*. The parasitic and predaceous insects which attack bumblebees are also briefly considered. The author discusses the nature and function of various individuals of the bumblebee colony.

Annual report of the Royal Sericultural Station of Padua (*Ann. R. Staz. Bacol. Padova, 31 (1902), pp. 140, pls. 3*).—An account of the general principles which should govern silk raisers in the selection of races of silkworms most suitable for any given locality is presented by E. Verson.

Experiments were undertaken by E. Quajat for the purpose of devising a method

by which it would be possible to distinguish the sex of silkworm eggs and larvæ. Numerous determinations were made on the specific gravity of eggs and the variations thus observed were noted, particularly with reference to the sex of the eggs as determined by rearing adult moths. It was found that the eggs could be divided roughly into 2 classes, with low and high specific gravity, respectively. No differences were observed in the vigor of the larvæ obtained from these different classes of eggs and no constant relation was observed between the specific gravity of the eggs and the sex. In general, however, there seemed to be a slight preponderance of female eggs among those of low specific gravity. Experiments with larvæ showed that while the actual weight of the larvæ could not be depended upon as indicating the sex, nevertheless about 72 per cent of the heavier larvæ and 29 per cent of the lighter larvæ proved to be females.

Detailed anatomical notes are given on the postembryonic development of the cephalic and thoracic segments of silkworms, by E. Verson. The comparative vigor of the first and last eggs fertilized by the same male moth was studied by E. Quajat. The results obtained indicate that the eggs of a large number of females may be fertilized by a single male, and that no differences are demonstrable in the fertility or vigor of the eggs. Experiments were made by the same author for the purpose of determining the influence of turpentine upon the vitality of silkworm eggs. The action of the fumes of turpentine upon the eggs was found to vary somewhat according to the temperature of the air. The injury was greatest in eggs of the White Japanese breed of silkworms and less so in the eggs of Korean, Chinese, and native races. Immersion of the eggs in pure turpentine killed a large majority.

The influence of external conditions of environment upon the physical properties of the cocoons was investigated by E. Verson, the results of observations carried out in various places in Italy being presented in tabular form. A bibliography of literature relating to sericulture published during the years 1902 and 1903 is appended to the report.

FOODS—NUTRITION.

Review of the literature of composition, analysis, and adulteration of foods for the year 1902, A. J. J. VANDEVELDE (*Separate from Bul. Serv. Surveill. Fabric. et Com. Denrées Aliment., 1903, pp. 95*).—This is the third annual volume reporting titles of articles on analytical methods, apparatus, water, milk and cream, fats and oils, cheese, flours and their derivatives, spices and colonial products, sugar, alcoholic beverages, vegetables and fruits, meats and meat products, preservatives, and related topics. In many cases the bibliographical data are accompanied by brief notes regarding the scope of the articles.

Report of State analyst, E. N. EATON (*Illinois State Food Com. Rpt. 1902, pp. 120–211, figs. 8*).—Of the 924 samples of food analyzed during the year 1902, 397 were found to be adulterated. In addition to other topics, grape juice, soda water, and soda-water sirups are discussed.

Pure food law and rulings of the food commissioner, E. F. LADD (*North Dakota Sta. Spec. Bul. 1, pp. 11*).—The State pure food law is quoted, and the author makes some suggestions for those who would comply with its provisions. The bulletin also includes the rulings of the State pure food commissioner regarding labels, standards, preservatives, etc.

Breakfast foods, J. B. WEEMS and C. E. ELLIS (*Iowa Sta. Bul. 74, pp. 101–114*).—A number of samples of breakfast foods, biscuits, hulled beans, split peas, potato chips, and other food materials were analyzed, and their relative nutritive value is discussed. In the case of some of the materials for which the claim is made by the manufacturers that they are in a sense predigested, the amount of soluble carbohydrates was determined and found to vary from 0.24 per cent to 13.23 per cent, being

in the majority of cases less than 2 per cent. This would indicate, according to the authors, "that the soluble sugars are present only to a limited extent in the breakfast foods. Those who are not troubled with indigestion should not desire predigested foods, and those who have indigestion should consult the family physician."

The general conclusions which were drawn from the investigation follow:

"The breakfast foods are put up in an attractive form and many of them are pleasing to the taste. The statements printed on the packages are greatly exaggerated and little reliance can be placed in many of them.

The cost of the prepared foods is 10 to 16 cts. per pound and the unprepared 6 to 7 cts. per pound. These products do not possess any nutritive value in excess of ordinary food materials. The attractive features are the packages and the palatableness of the food. The claims made for many of the predigested foods are of little or no value. The breakfast foods are not medicines and no reliance should be placed in statements which claim that they are a remedy for any disease."

Breakfast foods, J. B. Weems and C. E. Ellis (*Iowa Sta. Bul. 74, popular ed., pp. 101–106*).—An abridged form of the above bulletin.

On the relation between gluten and total nitrogenous matter in different kinds of wheat, E. Fleurent (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 26, pp. 1313–1315; Bul. Agr. Algérie et Tunisie, 9 (1903), No. 24, pp. 544–546; abs. in Rev. Sci. [Paris], 5. ser., 1 (1904), No. 2, p. 57*).—According to the author the wheats at present grown on a large scale in France have a lower gluten content than those formerly grown. Estimating the total amount of nitrogen in the wheat is not regarded as a satisfactory method for judging of its value. To learn this the amount of gluten should be determined.

The chemical composition of cooked vegetable foods, Katharine I. Williams (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 244–252*).—Analyses of a number of cooked vegetable foods are reported, the data including sulphur and phosphorus in addition to the usual determinations. It was found that in almost every case the cooked foods contained more water than the raw. However, with broccoli the weight of the raw and cooked material was practically the same, and in the case of asparagus there was a considerable loss in weight due to cooking which was ascribed to a loss of soluble nitrogenous constituents. The large percentage of waste, both before and after cooking, makes asparagus expensive. Raw-green burr artichokes are tough, and in the process of cooking absorbed a larger proportion of water than the other vegetables studied.

The food value of fruit, W. R. Lazenby (*Columbus Hort. Soc. Rpt. 1903, pp. 126–129*).—A number of points in connection with the food value of fruits are discussed.

The adulteration of foods and medicines, G. McCarthy (*Bul. North Carolina Bd. Health, 18 (1904), No. 11, pp. 124–131*).—Food adulteration and food preservatives are discussed, and some of the work of the North Carolina department of agriculture is summarized.

The composition of poultry, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1903, pp. 147–158*).—Analyses are reported of a number of sorts of fresh and preserved poultry and poultry products.

Poultry as food, R. D. Milner (*Connecticut Storrs Sta. Rpt. 1903, pp. 159–175*).—Noted from another publication (E. S. R., 15, p. 701).

Cold storage of eggs, H. V. Jackson (*Agr. Gaz. New South Wales, 14 (1903), No. 8, pp. 713–715*).—It is stated that the attempts made by the department of agriculture of New South Wales to preserve eggs in cold storage have been very successful. The method employed is briefly described.

Preserving eggs in water-glass solution (*Agr. Gaz. New South Wales, 14 (1903), No. 7, p. 676*).—In an article quoted from the *Mark Lane Express* concise directions are given for the use of water glass in preserving eggs, which, it is stated, are based on the results of 5 years' experience.

Preserving eggs (*Mark Lane Express, 88* (*1903*), *Nos. 3729, p. 335; 3730, p. 371*).—Brief directions are given for preserving eggs by a number of methods.

The caffein content of coffee infusion, J. Katz (*Arch. Pharm., 242* (*1904*), *No. 1, pp. 42–48*).—Using 300 gm. of water to 15 gm. of coffee, containing on an average 1.26 per cent caffein, an infusion was prepared in a number of ways and analyzed. The drip coffee which was made with a special apparatus contained 96.5 per cent, the infused coffee 85.2 per cent, and the coffee made by allowing the water to filter through the ground berry 60.3 per cent of the caffein originally present.

The amount of extract matter in the infusion was, generally speaking, proportional to the caffein content. Judged by the caffein content and the extract matter in the infusion, distilled water and hydrant water gave practically the same results, but when a little sodium bicarbonate was added to the water used for coffee making, the coffee was a little more thoroughly extracted. According to the author's calculations a cup of coffee (150 cc.) contains about 0.1 gm. caffein.

Concerning spices, A. Beythien (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6* (*1903*), *No. 20, pp. 957–964*).—A paper with discussion, presented at a meeting of the Association of German Food Chemists. The adulteration of mace, pepper, and other spices is discussed on the basis of analytical data.

Judging vinegar, G. Popp (*Ztschr. Untersuch. Nahr. u. Genussmtl., 6* (*1903*), *No. 20, pp. 952–956*).—A paper with discussion, presented at a meeting of the Association of German Food Chemists. Experiments are reported which have to do with the establishment of a standard of strength for vinegar. As shown by tests in which vinegar was added to food, that containing a small amount of acetic acid (1.14 per cent) was as satisfactory as stronger vinegar (containing 2.4 per cent acetic acid). In other words, weak vinegar, the author concludes, is as satisfactory as a condiment as stronger vinegar.

From artificial digestion experiments with pepsin it appeared that neither vinegar containing 2 per cent acetic acid nor that containing 4 per cent had any effect upon digestibility. Vinegar with less than 2 per cent acetic acid was not found to be a satisfactory preservative for meat, etc., for short periods. On the other hand, vinegar with 2 per cent or more acetic acid was satisfactory.

Composition of fruit juice, K. Farnsteiner et al. (*Ber. Hyg. Inst. Hamburg, 1900–1902, p. 61; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 5, p. 309*).—The expressed and strained juice of a number of sorts of berries was analyzed.

Concerning the marmalade industry, F. Strohmer (*Ber. Chem. Tech. Vers. Stat. Zent. Ver. Rübenz. Ind. Oesterr.-Ung., 1902, pp. 5, 6; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7* (*1904*), *No. 5, pp. 308, 309*).—Examination showed that the English jams and marmalades did not contain glucose, though this substance was found in similar goods of local manufacture.

The nutrition investigations of the Storrs Experiment Station, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1903, pp. 99–102*).—A brief historical account of the nutrition investigations of the station, particularly those carried on in cooperation with this Department.

The conservation of energy in the living organism, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1903, pp. 103–122*).—The author discusses the conservation of energy on the basis of his experiments with the respiration calorimeter. Considering the total number of experiments with man at work and at rest, covering in all 143 days, there was a difference of only 53 calories between the total income and total outgo of energy. The author believes, therefore, that the experiments demonstrate that the law holds good with the living body.

The demands of the body for nourishment and dietary standards, W. O. Atwater (*Connecticut Storrs Sta. Rpt. 1903, pp. 123–146*).—On the basis of a considerable amount of data summarized from his own experiments and those of other investigators, the author discusses dietary standards and proposes tentative

standards suitable for persons performing different amounts of work. The fact is emphasized that many more dietary studies, metabolism experiments, and special feeding tests are necessary before definite standards can be determined upon. "The standard must vary not only with the conditions of activity and environment, but also at the nutritive plane at which the body is to be maintained. A man may live and work and maintain bodily equilibrium on either a higher or lower nitrogen level or energy level;" but the most advantageous level needs to be determined.

The fact that appetite is not necessarily the measure of the demand for nutriment is pointed out, and the need of caution in basing general theories of nutrition upon the results of special experience is emphasized.

While recognizing the value of tables of composition of food materials, dietary standards, and daily menus showing the proportions of different food materials required to furnish an adequate diet, the author protests against the too mechanical use of such numerical data.

The conservation of energy in those of advancing years, J. M. TAYLOR (*Pop. Sci. Mo., 64 (1904), No. 4, pp. 343–350*).—In addition to other topics food and diet are discussed with special reference to old age. The author regards moderation in eating and drinking as of the utmost importance.

The A B–Z of our own nutrition, H. FLETCHER (*New York: Frederick A. Stokes Co., pp. XXXVI+426, figs. 10*).—On the basis of personal experience the author believes that overeating should be avoided, and that health may be maintained by eating a comparatively limited amount of food and taking pains to masticate it as thoroughly as possible, the normal appetite being a guide as to kind and amount of food required. The volume contains an explanation of the author's theories, and quotes a number of articles by different writers of interest in connection with the subjects under discussion.

The function and digestion of foods, G. G. NASMITH (*Assoc. Executive Health Officers' Rpt., Ontario, 1903, pp. 109–117*).—A discussion of the theories of nutrition, including results of Pawlow's recent work on digestion (E. S. R., 14, p. 789).

How we are fed, J. F. CHAMBERLAIN (*New York: Macmillan Co., 1904, pp. XIV+214, figs. 63*).—A reader for primary schools, the subject-matter of which concerns the origin of common food products and similar topics.

The action of X-rays upon nutrition, LÉPINE and BOULUD (*Lyon Méd., 1903, Dec. 13 and 20; abs. in British Med. Jour., 1904, No. 2251, Epit., p. 31*).—A series of experiments on animals and animal organs and tissues showed that the X-rays induced or increased glycolytic power under certain conditions. For instance, a portion of the pancreas of a dog exposed to the action of X-rays for an hour and 30 minutes caused increased conversion of starch to sugar, the proportion of sugar to that found in a control test with pancreas not thus acted upon being 471: 413. The action on the starch was continued for 4 hours in each case. In the experiments with animals it was found that the interposition of an aluminum plate prevented the oppressive lassitude and anorexia, which the direct action of the rays tends to produce.

Food and cookery for the sick and convalescent, FANNIE M. FARMER (*Boston: Little, Brown & Co., 1904, pp. XIV+289, pls. 42, figs. 3*).—Some of the principal subjects discussed are infant feeding, child feeding, and food for the sick. Chapters are devoted to the principal foods and beverages and a large number of recipes are given. Throughout the volume the author has included data regarding the composition of foods and has discussed the subjects under consideration to a large extent from the standpoint of nutritive values and the general theory of nutrition.

Food for the tropics, T. M. MACKNIGHT (*London: Thacker & Co., 1904, pp. 126; rev. in British Med. Jour., 1904, No. 2254, p. 611*).—Tropical foods and their uses are described, the general plan being to note the various tropical products which may replace those more familiar in other regions. A list of tropical vegetables and methods of cooking them is given, as well as similar lists of fruits and condiments.

Some thoughts on market hygiene, H. B. BASHORE (*Sanitarian, 52 (1904), No.*

412, pp. 243, 244).—The need of improvement in marketing and handling food is discussed, the fact being recognized that it may readily become contaminated by dirt and micro-organisms, including disease germs, when marketed under the conditions which often prevail.

Concerning human pancreatic juice, K. GLAESSNER (*Ztschr. Physiol. Chem., 40* (*1904*), *No. 5–6, pp. 465–479, dgms. 4*).—A surgical operation which necessitated the insertion of a drainage tube into the pancreatic duct of a patient afforded the author the opportunity of collecting and studying pancreatic juice. According to his observations, the amount secreted varied from 500 to 800 cc. per day. It did not contain trypsin, but a precursor of this, which was rendered active by the intestinal juice.

The action of the fat-splitting and diastatic ferments was increased by gall and intestinal juice, but especially by the latter. The cleavage of starch stopped with maltose. Disaccharids (milk sugar and cane sugar) were not acted upon by pancreatic juice, but were split up into simpler bodies by intestinal juice. The amount of digestive juice and of ferment and the alkalinity were least when the subject was fasting. These factors increased rapidly after food was taken, reached their maximum in about 4 hours, and diminished until the eighth hour of the digestive process.

A study of the variations in the course of the nitrogen, sulphate, and phosphate excretion, as observed in short periods following a small increase in the proteid ingested, P. B. HAWK and J. S. CHAMBERLAIN (*Amer. Jour. Physiol., 10* (*1904*), *No. 6, pp. 269–289, figs. 5*).—Continuing work recently reported (E. S. R., 15, p. 494), the authors were the subjects of experiments to determine the effect of adding a small amount of protein to a uniform basal ration, as shown by the excretion of nitrogen, phosphorus, and sulphur.

It was found that the rate of excretion of nitrogen, measured by 3-hour periods, showed 2 maxima daily. When measured by shorter periods, 3 maxima were observed.

"The rate of excretion of sulphates followed in general a parallel course to that of nitrogen, the main difference being that the minimum rate of excretion was reached after the morning meal, and the maximum late in the afternoon. Frequently 3 maxima were observed on normal days with 3-hour periods. The phosphates differed decidedly in their rate of excretion from either the nitrogen or the sulphates. Two very distinct rises were shown each day, and in one instance . . . an indication of a third rise was seen. . . .

"After the ingestion of a small extra amount of proteid food at the morning meal, the rate of excretion of nitrogen reached its maximum within three to four and one-half hours, after which it fell to its normal rate; in one case slowly, after 4 days, and in the other rapidly, after 2 days. It would seem that the time required to reach the maximum excretion of nitrogen, after increasing the proteid of a diet, was more or less directly proportional to the amount of proteid ingested, the length of time being greatest when the quantity was large.

"With each subject the maximum rate of sulphate excretion differed from that of nitrogen only in reaching its highest point about 6 hours later. In one subject the ratio of nitrogen to sulphates was lowest on the day of increased proteid ingestion; in the other, on the day after the ingestion. The maximum rate of phosphate excretion due to the increased proteid ingestion fell in a period between those in which the maxima of nitrogen and sulphate occurred. . . .

"The ratio between the heat of combustion of the urine and its nitrogen content was lower on the day of increased proteid ingestion than on normal days."

The effect of certain common essences on the cerebral circulation, A. D'ORMEA (*Arch. Ital. Biol., 40* (*1903*), *No. 1, pp. 141–160; abs. in British Med. Jour., 1904, No. 2251, Epit., p. 31*).—It was found in experiments with a dog that the essences of aniseed, lemon, mint, cinnamon, and camphor had a very decided effect on the cerebral circulation. These observed facts are of interest since some of the materials experimented with are commonly used for flavoring foods, etc.

ANIMAL PRODUCTION.

Range forages, R. H. Forbes and W. W. Skinner (*Arizona Sta. Rpt. 1903, pp. 348–350*).—Analyses are reported of greasewood (*Sarcobatus vermicularis*), paloverde twigs, water grass (*Chloris elegans*), 2 varieties of grama grass (one fresh the other old and weathered), and several varieties of saltbush. The composition of a number of these is shown in the following table:

Composition of a number of feeding stuffs.

Feeding stuffs.	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Greasewood (*Sarcobatus vermicularis*)	4.55	19.81	2.45	34.28	24.50	14.41
Paloverde twigs	5.10	10.94	3.20	39.05	36.01	5.70
Water grass (*Chloris elegans*)	7.60	8.88	1.61	36.53	33.62	11.76
Grama grass (*Bouteloua oligostachya*), fresh sample	6.98	6.50	1.82	42.45	28.19	14.06
Grama grass (*B. rothrockii*), sample 1 year old, dead and weathered	7.35	2.56	1.22	50.58	33.62	4.67

"Greasewood and paloverde twigs are instances of the 'browse' forage upon which animals so largely depend in semiarid country when grass is short. These are of surprisingly nutritious character, as indicated by the analyses here given, being rich in protein, fat, and carbohydrates. The sample of greasewood is especially good, being considerably richer in protein and fat than a sample of alfalfa hay from the station farm.

"The low protein in old, weathered 'grama' grass, as compared with fresh grasses of the same general nature, bears out the low estimate generally placed upon weathered grass as forage."

Commercial feeding stuffs in the Connecticut market (*Connecticut State Sta. Bul. 145, pp. 59*).—In accordance with the provisions of the State feeding stuff law analyses are reported of cotton-seed meal, linseed meal, wheat bran, middlings and mixed feed, maize meal and bran, gluten meals and feed, hominy meal, rye feed, brewery and distillery products, oat feeds, buckwheat middlings, miscellaneous mixed feeds, poultry feeds, proprietary, dairy, stock, and condimental feeds. The different classes of the feeding stuffs analyzed are discussed.

Regarding the proprietary, dairy, and stock feeds, the author notes that these feeding stuffs were made up of such materials as oat, wheat, and corn products, cotton-seed meal, linseed meal with fenugreek, carob beans, and common beans in addition in the case of one of the materials examined. The most concentrated of these mixtures contained 24.6 per cent protein and the others ranged from 7.81 to 20.06 per cent. The prices varied from $21 to $70 per ton.

"A mixture of 1,000 lbs. of gluten feed and 1,000 lbs. of mixed wheat feed made at home would cost at present retail prices $24.76. It would contain a good deal more protein than could be bought for the same money in any of these factory-mixed feeds and would have a higher feeding value. It would also have this added advantage, that the feeder would know exactly what his animals were eating.

"In other words, the cost of most of these factory-mixed feeds is quite out of proportion to their feeding value."

Commercial feeding stuffs, J. L. Hills, C. H. Jones, and F. M. Hollister (*Vermont Sta. Bul. 104, pp. 187–192*).—In order to learn how the actual compared with the guaranteed composition, a number of analyses were made in accordance with the State feeding stuff law of cotton-seed meal, linseed meals, gluten meals and feed, dried distiller's grains, oat and other commercial feeds, provenders, wheat offals, and condimental feeds. In most cases protein was the only constituent determined. The

authors also made an attempt to learn the ingredients used in compounding the condimental feeds examined.

"The claims made for these feeds are essentially, first, that they are appetizers, promoting and improving digestion, and therefore increasing production, be it work, flesh, milk, or wool, and, second, that they possess medicinal virtues of a high order. Touching the first claim it may be said that there is no valid evidence to the effect that condiments or spices increase the digestibility of food or enlarge production, while such evidence does exist to prove the contrary. As to the second claim it may be remarked that the drugs commonly present are simple and well-known remedies, which may do good at times, which are quite harmless, and in cases of more than slight indisposition doubtless quite as ineffectual as harmless."

Methods of discriminating between Egyptian and Bombay cotton-seed cakes, J. A. VOELCKER (*Analyst, 28 (1903), No. 330, pp. 261–263, figs. 6*).—A method of distinguishing between Egyptian and Bombay cotton-seed cakes is suggested, which depends in part upon microscopical, physical, and chemical characteristics. According to the author, the Bombay cake almost invariably contains borax and the percentage of sand (matter insoluble in hydrochloric acid) is considerably higher than in Egyptian cake.

The microscopic examination of American cotton-seed cake, A. L. WINTON (*Analyst, 29 (1904), No. 335, pp. 44–47*).—According to the author, there is no entirely satisfactory method of discriminating between Sea-island cotton-seed and upland cotton-seed cake.

"So far as concerns the mere detection of excessive amounts of hulls or starchy adulterants, microscopic examination, especially if coupled with determinations of nitrogen and fiber, is all that could be desired."

This investigation was suggested by that noted above.

Results of analysis of manures and of feeding stuffs for feeding experiments, S. H. COLLINS (*County Council Northumberland, Education Com., Rpt. 1903, pp. 92–94*).—Analyses are reported of a number of feeding stuffs and fertilizers.

Experiments on the digestibility of rye and wheat bran of different grades, A. KÖHLER ET AL. (*Landw. Vers. Stat., 58 (1903), No. 5–6, pp. 415–432*).—Using 2 sheep the digestibility of different sorts of wheat and rye bran was studied. Some of the brans selected were typical of the goods obtained by modern methods of milling; the others contained a larger percentage of starch, and were considered typical of the bran obtained from old-fashioned mills. The materials under investigation were fed with meadow hay, the digestibility of the bran alone being calculated from the results obtained for the whole ration. It appeared that the rye bran was more thoroughly digested by both sheep than the wheat bran. From the data as a whole the conclusion is drawn that the bran obtained by modern milling has a lower nutritive value than old-fashioned bran.

The effect of drying upon the solubility of protein of feeding stuffs in pepsin-hydrochloric acid, J. VOLHARD (*Landw. Vers. Stat., 58 (1903), No. 5–6, pp. 433–437*).—After preliminary experiments with fresh hay and fresh and dried clover had shown that drying diminished digestibility, the author made a systematic study of the effect of temperature upon the nitrogen content and the digestibility of the protein in a number of feeding stuffs, the results obtained being summarized in the table below. The samples were dried for 48 hours at 40, 60, and 100° C. Brewers' grains and distillery refuse, it is pointed out, are materials which are subjected to a fairly high temperature in the process of preparation. Such is not the case with the other feeding stuffs examined.

Effect of heating upon the digestibility of protein.

Kind of feed.	Total nitrogen in fresh feed.	Coefficient of digestibility of protein— Of undried feed.	Of feed dried at 40°.	Of feed dried at 60°.	Of feed dried at 100°.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Meadow hay	1.750	74.3	70.9	67.4	61.6
Palm-nut cake	2.924	82.8	80.7	81.6	80.1
Cotton-seed meal	7.296	94.8	93.0	88.5	91.5
Peanut meal	7.946	96.7	95.2	94.8	93.7
Cocoanut cake	3.441	91.8	90.9	90.8	90.4
Rye	1.669	92.4	89.0	88.7	88.7
Wheat	2.186	95.9	92.0	92.1	91.5
Vetch	4.534	95.3	92.9	93.9	94.2
Maize	1.817	88.6	83.7	84.5	85.0
Peas	3.968	95.5	93.5	93.2	93.4
Brewers' grains	3.416	76.2	75.8	74.2	58.3
Distillery refuse	4.991	60.4	56.1	59.1	44.8

The results are summarized as follows: Drying diminishes the digestibility of protein, the effect being proportional to the degree of heating. If the temperature employed is not over 60°, the digestibility is not markedly lowered. Heating lowers the digestibility of the protein of materials which have been heated in the process of manufacture, such as dried brewers' grains and distillers' grains.

Comparative tests of digestibility of protein by artificial and natural methods, K. von Dambski (*Inaug. Diss., Univ. Breslau, 1903, pp. 69*).—The literature of the subject is summarized at considerable length and experiments reported which compare the digestibility of protein by the Stutzer and the Kühn methods with the results obtained in natural digestion experiments with sheep.

The rations tested included meadow hay alone and with wheat bran, clover hay alone and with peanut cake, and meadow hay with dried beet chips. One of the points especially considered was the effect of heat employed in drying feces upon the protein present, and in this connection some tests were also made with horse and cow feces. The author's general conclusion is that natural and artificial digestion experiments do not give absolutely concordant results, since certain variations are unavoidable. The smallest discrepancies were observed when the metabolic products in the feces were determined by the Stutzer method with pepsin and trypsin. He believes, therefore, that the Stutzer method is the most satisfactory method for determining coefficients of digestibility in artificial digestion experiments.

Numerous tests are included in the above investigation on the effect of different amounts of digestive ferment and the effect of the time element on the reaction.

Concerning the nitrogen content and the solubility in pepsin-hydrochloric acid of the protein of fresh and dried sheep manure, C. Beger (*Ztschr. Physiol. Chem., 40 (1903), No. 3-4, pp. 176-181*).—In the experiments reported sheep were fed in the different periods hay, hay plus peanut oil, hay plus straw, a fat-free mixed ration, and a mixed ration containing oil. The amount of digestible protein in the fresh and the dried feces was determined by the pepsin-hydrochloric acid method. It was found that considerably higher values were obtained with the fresh than with the dried feces. The author believes that it is best, therefore, to retain the usual method and use fresh feces for the determination of the nitrogenous material insoluble in pepsin-hydrochloric acid. This is especially important in determining the coefficients of digestibility of a mixed ration.

Fate of proteids introduced through the alimentary canal and otherwise, C. Oppenheimer (*Beitr. Chem. Physiol. u. Pathol., 4 (1903), pp. 263-278; abs. in Jour. Chem. Soc. [London], 84 (1903), No. 493, II, pp. 738, 739*).—Experiments with rabbits showed that when foreign proteids (serum from other animals and egg white) were injected intravenously or intraperitoneally, they were directly utilized and only

small and variable amounts were excreted in the urine. The amount so excreted showed no relationship to preciptin formation.

On the digestion and absorption of albuminoids in the stomach and in the first part of the duodenum, E. Zunz (*Beitr. Chem. Physiol. u. Pathol., 3 (1902), pp. 339–364; abs. in Bul. Soc. Chim. Paris, 3. ser., 30 (1903), No. 23, p. 1285*).—Using sulphate of zinc as a reagent for fractional precipitation, the author studied the contents of the stomach and duodenum in an experiment with a dog fed cooked beef.

Concerning the origin in the animal body of metabolic products containing sulphur, I, J. Wohlgemuth (*Ztschr. Physiol. Chem., 40 (1903), No. 1–2, pp. 81–100*).—From experiments in which cystein was given to rabbits per os, it appeared that this body in so far as it is resorbed is converted into taurin and at least in part appears as taurocholic acid in the gall. Since cystein normally accompanies the pancreatic digestion of proteid, the author considers that the origin of taurin in the animal organism is explained. As he points out, it remains to be seen whether cystein is solely a product of tryptic digestion, or whether it is also formed, which he believes is more probable, by autolysis with the aid of tissue ferments.

Combustion of the muscular carbohydrate and the influence of the pancreas on it, I, O. Cohnheim (*Ztschr. Physiol. Chem., 39 (1903), No. 3–4, pp. 336–349*).—From experiments made with dogs without a pancreas and tests with the cell-free juices of muscle and pancreas, the conclusion was drawn that the combustion of dextrose in the body requires the cooperation of muscles and pancreas. Combustion is attributed to a muscle ferment which is rendered active by an internal secretion from the pancreas. One gram of muscle can break down 5 to 8 gm. of dextrose. The action is inhibited by blood serum.

Experiments on the intermediate metabolic products of carbohydrates. I, Concerning ethylenglycol and glycolaldehyd, P. Mayer (*Ztschr. Physiol. Chem., 38 (1903), No. 1–2, pp. 135–156*).—The author presents a critical discussion of methods of experimenting and emphasizes the need of looking for intermediate products, as well as end products of cleavage. Experiments are reported in which rabbits were fed ethylenglycol and glycolaldehyd, which led to the conclusion that when ethylenglycol was burned by the rabbit glycolic and oxalic acids were the intermediate products. When 10 gm. of glycol was fed about one-fourth of it appeared as glycolic acid. As regards the glycolaldehyd, the author considered it probable that it was directly condensed in the body to glucose.

The effect of feed upon the character of body fat, O. Lemmermann and G. Linkh (*Landw. Jahrb., 32 (1903), No. 4, pp. 635–653*).—An experiment with pigs is reported in which the effect of maize and palm-nut cake on the character of body fat was studied, and also the effect of substituting palm-nut cake for maize for 2 to 6 weeks before slaughtering, the ration in every case having a wide nutritive ratio. In no case were the pigs overfed, since they were still growing.

The bacon from those fed palm-nut cake throughout the whole period was harder than that of the other pigs, otherwise no marked differences were noted. With all the animals the back fat had the lowest melting point, and the highest iodin number and refraction index; and next to this the belly, kidney, and intestinal fat, in the order mentioned. The further from the surface, the lower the oleic acid content of the fat and the higher the melting point and vice versa. Judged by its chemical and physical properties the fat of the pigs fed palm-nut cake was of better quality than that from pigs fed maize, though the differences were not very great. Substituting palm-nut cake for maize for 2 to 6 weeks did not exercise any favorable effect on the quality of the fat under the experimental conditions.

The absorption of fat, B. Moore (*Physiol. Lab. Univ. Col., Liverpool, 1903; abs. in British Med. Jour., 1904, No. 2252, Epit., p. 36*).—According to the author, fatty acid and fat have the same appearance in the basal parts of the epithelial cells of the small intestine after appropriate staining. Therefore, the method commonly

employed does not show conclusively that fats are split into fatty acids and glycerin and absorbed either as fatty acid or soap; however, chemical studies which he carried on are believed to have established the correctness of the above theory. Washed and scraped mucous membrane obtained from a digesting animal contained 15 to 35 per cent of its fat in the form of fatty acid, while in the fluid of the lacteals 96 per cent of the fatty material was present as neutral fat. The synthesis, therefore, was completed in the mucous membrane of the intestine.

Meat on the farm, A. Boss (*U. S. Dept. Agr., Farmers' Bul. 183, pp. 39, figs. 35*).—Various subjects connected with the butchering, curing, and preservation of meat on the farm are discussed, including such topics as the selection of animals, preparation for slaughter, killing and dressing cattle, sheep, hogs, and poultry; cooling and cutting the carcass; preservation of fresh meat, and curing meat. In connection with the subject of preserving meat a number of recipes are given, as well as detailed directions for salting and smoking.

Marketing live stock, C. S. Plumb (*U. S. Dept. Agr., Farmers' Bul. 184, pp. 40*).—The subject of marketing live stock is discussed and suggestions are offered for facilitating the marketing of farm animals. The topics discussed include, among others, buying and selling in country districts, periodical auction sales, rules and methods in Chicago horse market, stock yards, live-stock exchanges, inspection of stock, the abattoir and packing house, the market classification of live stock, shipment of stock by railway, and the export trade. The bulletin contains much statistical and general information pertaining to the subjects discussed.

The use of branding fluid, G. H. True (*Arizona Sta. Bul. 47, pp. 314–317*).—A fluid which was tested for branding cattle, in the author's opinion, did not give as satisfactory results as are generally obtained with the branding iron..

The food cost of raising calves, C. L. Beach (*Connecticut Storrs Sta. Rpt. 1903, pp. 187–190, figs. 4.*)—For several years records have been kept of the feed consumed by heifer calves from birth until about 6 months old. They were fed whole milk at first and later skim milk. Rowen hay was always supplied and grain in some cases during the last 2 months of the feeding period.

The gains noted, 1.25 lbs. in 1900 and 1.31 lbs. in 1899 per head per day, were regarded as satisfactory for animals designed for the dairy herd. The cost of feed required for 6 months' feeding was 44.6 cts. per week in one year and 47.3 cts. in the other. On the basis of observed data the cost of raising calves from birth to maturity (a little over 2 years) was $33.20.

"Kälberrahm" with skim milk as a milk substitute in calf feeding, J. Käppeli (*Landw. Jahrb. Schweiz, 17 (1903), No. 8, pp. 401–418, figs. 3*).—As shown by feeding experiments with calves "Kälberrahm," a commercial feeding stuff designed as a substitute for milk fat, did not give as satisfactory results as whole milk, 14.54 liters of "Kälberrahm" and skim milk being required per kilogram of gain as compared with 10.9 liters of whole milk or 16.4 liters of skim milk. When the quality of the flesh was taken into account the results, the author states, were even more unfavorable to the "Kälberrahm" and skim milk.

Live stock. Steer feeding, H. E. Stockbridge (*Florida Sta. Rpt. 1902, pp. 13–16*).—Notes are given regarding the live stock kept at the station, and feeding experiments with steers are briefly reported. Two grade oxen, fed chiefly on velvet-bean forage, made a gain of 3.5 lbs. per head per day, as compared with 2.17 lbs. made by a pair of native oxen under similar conditions, the profit in the 2 cases being $7.61 and $7.31 per ox. The time covered by the test was 60 days.

In a second test velvet-bean pods were compared with cassava and cassava pulp (refuse from a starch factory). Lot 1 (2 steers) was fed 3 bu. of velvet beans in pods; lot 2 (3 steers) was fed 30 lbs. of cassava and 5 lbs. of cotton-seed meal; and lot 3 (3 steers), 18 lbs. of cassava pulp and 5 lbs. of cotton-seed meal, all the animals receiving cowpea-vine hay in addition to the feeding stuffs mentioned. In the 60

days of the test the steers in lot 1 (velvet-bean pods) made a total gain of 120 lbs.; in lot 2 (cassava) of 324 lbs., and in lot 3 (cassava pulp) of 304 lbs.

"Velvet beans alone with roughage are inferior to a ration in which cassava is the predominating ingredient. In this connection it is well to note that the general appearance of lot 1 was deceptive, the oily character of the bean, or some other property, giving a glossy appearance to the coat and imparting a general smoothness of exterior indicative of better condition than actual weights justified. The conclusion seems to be warranted, therefore, that the addition of cassava to the ration of steers ranging on velvet-bean pasture in the winter would be a material advantage.

"The refuse pulp from the starch factories is a valuable feed stuff closely approximating the results obtained from cassava root."

Methods of steer feeding, T. I. Mairs and A. K. Risser (*Pennsylvania Sta. Bul. 64, pp. 8*).—Continuing earlier work (E. S. R., 15, p. 171), the relative merits of feeding steers in barns and open sheds was tested with 2 lots of 12 animals each, weighing about 830 lbs. Lot 1 was fed in a large pen or box stall in the college barn, and lot 2 in a yard with a shed.

The test began November 26 and covered 18 weeks. Both lots were fed similar rations of corn stover and clover hay, with corn-and-cob meal and cotton-seed meal 12:1 in addition during the first part of the test, and later corn meal and cotton-seed meal in the same proportion. In the case of the steers fed in the barn the average daily gain was 2.12 lbs. and the cost of a pound of gain 9.53 cts. Similar values for the animals fed in a shed were 1.97 lbs. and 10.372 cts. The amount eaten by the lot fed in the shed was somewhat the greater, 6.07 lbs. of coarse fodder and 8.53 lbs. of grain being required per pound of gain as compared with 5.57 lbs. of the coarse fodder and 7.83 lbs. of grain in the case of the lot fed in the barn. Self-registering thermometers were used throughout the experiment to record the temperature in the shed and in the barn. As was to be expected, the lower temperature was found in the shed.

According to the authors, "the general result of all these comparisons may be summarized in the statement that the lot fed in the open shed produced a slightly smaller gain and produced it at the expense of a somewhat greater amount of food. It is not so clear, however, that the lower temperature to which lot 2 [fed in the shed] was exposed was the cause of the difference. . . .

"On the whole, while the barn-fed lot appears to have given slightly better results, the differences are not very marked, and in view of the wide difference observed between individual animals in each lot it is not at all impossible that the selection of the animals, and the conditions other than temperature which surrounded them, had quite as much to do with the differences as the mere exposure to cold. In other words, the results of a single trial of this sort are never decisive, and they are presented here simply as a record of progress. It is proposed to continue the experiments through several seasons in the hope of securing conclusive results."

Feeding experiments with gluten feed and other feeds, D. A. Gilchrist (*County Council Northumberland, Education Com., Rpt. 1903, pp. 76–82*).—Using 4 lots, each made up of 2 blue-grey heifers, 1 blue-grey steer, and 1 Shorthorn steer, the author studied the relative feeding value of Buffalo gluten feed, rough cotton-seed cake, and barley meal 1:1, decorticated cotton-seed cake and barley meal 1:1, and linseed cake and barley meal 1:1. "The first 2 of these [rations] are practically the same in chemical composition, but the last 2 are richer." Three to 6 lbs. of concentrated feeds were fed per head daily in addition to a basal ration of 8 to 10 lbs. of hay with 28 lbs. of turnips.

At the beginning of the test the animals in each lot weighed not far from 525 lbs. each. In the 7 months of the trial the gains ranged from 1.73 lbs. with the lot fed rough cotton-seed cake and barley meal, to 1.93 lbs. with the lot fed decorticated cotton-seed cake and barley meal. The greatest profit was also obtained with the lot

fed gluten feed. "There is a prejudice in favor of linseed cake for feeding young cattle, but both rough and decorticated cotton cakes have given considerably better financial results than linseed cake."

As regards the relative value of the different breeds the results, according to the author, "are distinctly in favor of the 4 Shorthorn bullocks, which increased on the average 32 lbs. in weight more than the blue-grey bullocks during the time of the experiment."

Cattle-feeding experiment, T. H. MIDDLETON (*Cambridge [England] Univ., Dept. Agr., Rpt. Expts. Crops and Stock 1903, pp. 80–87*).—Using 2 lots of 4 heifers each, 5 to 6 lbs. per head per day of gluten feed was compared with a like amount of a mixture of bruised wheat and decorticated cotton-seed cake 2:1, the concentrated feed being supplemented in each case by mangel-wurzels with hay or hay and straw chaff.

The feeding period varied somewhat with the different animals, being on an average 111.5 days. On gluten feed the total gain was 260.75 lbs. and on wheat and cotton-seed cake 246.75 lbs., the cost of feed per head per day in the 2 cases being 15 cts. and 16 cts. The carcass yield of the lot receiving gluten feed was the greater, but the flesh was thought to be inferior in quality. Considering the test as a whole the 2 rations are regarded as of nearly equal value.

The value of roots in cattle feeding, T. H. MIDDLETON (*County Council Northumberland, Education Com., Rpt. 1903, pp. 42–55*).—In an experiment carried on in 1900–1, a lot of cattle was fed 56 lbs. of roots, chiefly swedes, per head per day in addition to other feed, and a second lot was fed 28 lbs. of the same sort of roots per head per day with 2.75 lbs. clover hay, 0.5 lb. maize meal, and 0.5 lb. of molasses in place of the remaining amount of roots. Satisfactory gains were made by both lots, but the ration containing the full amount of roots was considerably cheaper.

In 1901–2 a test was carried on under practically the same conditions. Two lots of 8 young cattle which had gained respectively 1.68 lbs. and 1.73 lbs. per head per day since birth, were fed for 7 months the same basal ration made up of grain, hay, and a little molasses. In addition lot 1 was fed 28 lbs. of Swedish turnips per head per day, while lot 2 was given 0.5 lb. of maize meal, 0.25 lb. molasses, and 2.75 lbs. clover hay in place of the roots. The average daily gain per head on the ration containing Swedish turnips was 1.98 lbs. as compared with 1.83 lbs. on the ration without roots. The animals fed no roots were worth less money at the close of the feeding test and the profit per lot was $3.35 per head less than in the case of the steers fed roots.

The author concludes that well-bred yearling cattle may be fattened without roots as under the experimental conditions, but that such a ration is not to be recommended. "At least 28 lbs. of swedes should be fed daily, and 42 lbs. to 56 lbs. may be given with profit."

Feeding beet pulp to steers and sheep, R. W. CLARK (*Utah Sta. Bul. 82, pp. 3*).—Tests made with sheep and steers to ascertain the value of beet pulp are briefly reported. According to the author, both the steers and sheep fed alfalfa and beet pulp only made the smallest gains per day and required the largest amount of dry matter per pound of gain, though they gave the largest profits. The steers made a pound of gain from 11.5 lbs. of alfalfa hay and 31.4 lbs. of beet pulp at a cost of 2.8 cts. In the case of sheep the cost of a pound of gain was 3.8 cts., and 16.6 lbs. of alfalfa and 36.7 lbs. of beet pulp were required.

When beet pulp was fed ad libitum with alfalfa to steers it had a value of $1.85, and when similarly fed to sheep it had a value of $1.13 per ton. On a full ration of alfalfa and grain (bran and shorts 1:1) steers made a pound of gain at a cost of 4.93 cts. With another lot fed alfalfa, grain, and beet pulp a pound of gain cost 3.98 cts. When a full ration of alfalfa and pulp was fed with a half ration of grain a pound of gain was made from 9.2 lbs. of alfalfa, 2.03 lbs. of grain, and 19.1 lbs. of pulp, the

cost being 3.51 cts. When a full ration of grain and pulp was fed with a half ration of alfalfa a pound of gain was made from 4.28 lbs. of alfalfa, 3.65 lbs. of grain, and 21.3 lbs. of pulp at a cost of 3.84 cts.

In the author's opinion, molasses in small quantities (4 lbs. per head per day) fed with 8 lbs. of grain per head per day and beet pulp ad libitum had a value of $2.35 per ton.

The bulletin also contains a brief general discussion of methods of feeding beet pulp.

The feeding of undecorticated cotton cakes to cattle and sheep on pasture, D. A. Gilchrist (*County Council Northumberland, Education Com., Rpt. 1903, pp. 72–75*).—The comparative merits of Egyptian and Bombay cotton-seed cakes, which are both made from seed which has not been delinted or decorticated, were tested with cattle and with wethers, lambs, and ewes for 2 months, the cattle being fed 3 to 5 lbs. of cake per head daily during the first month and later 7 lbs. of the cake, and the sheep from 0.25 lb. to 0.5 lb. Considering the test as a whole greater gains were made on the Bombay cake than on the Egyptian cake. The Bombay cake was also considerably cheaper. "So far there is no reason to suppose that the harder and more woolly Bombay cake has had any injurious effects on the animals to which it was fed; but this can only be satisfactorily ascertained by a trial covering a considerably longer period."

Analyses of the 2 sorts of cotton-seed cake and of Indian cotton seed by S. H. Collins are reported. The differences observed were not great. "The physical character of the fiber of the 2 cakes is, however, very different; the fiber of the Bombay cotton cake having an objectionable woolly nature. . . . Indian cotton seed [is] a food greatly esteemed in India for feeding milch buffaloes and cows. Indian cattle do not appear to object to the woolly character of the fiber, and if British cattle are more fastidious it is probably due to the fact that they are accustomed to better feeding."

Manures for pasture in Tree Field, D. A. Gilchrist (*County Council Northumberland, Education Com., Rpt. 1903, pp. 2–18, dgms. 3*).—The effect of manures on pasturage as shown by gains in weight made by sheep was studied under practically the same conditions as in earlier work at Cockle Park (E. S. R., 13, p. 175). In the 20 weeks of the test the average weekly gain per sheep on all the plats was 2.2 lbs. The total gain in weight in excess of gains made by the sheep on the untreated plat ranged from 27 lbs. made by the 5 sheep on the plat which had been manured by 5 tons of common lime in 1897 to 144 lbs. made by 10 sheep on the plat which had been manured with 1,680 lbs. of basic slag in 1900. At the close of the test sheep were selected for slaughtering from the lots which contained suitably fattened animals. It appeared that sheep fattened best on the plat manured with 560 lbs. of basic slag in 1897 and the same amount in 1900.

The amount of forage remaining on the plats at the close of the season was measured by feeding it to cattle during the winter. A botanical analysis of the hay growing on the different plats is reported.

The effect of nitrogenous manures on the feeding value of hay, T. H. Middleton (*County Council Northumberland, Education Com., Rpt. 1903, pp. 56–68*).—Since it was found that nitrogenous manures exercise a pronounced effect on the character of the hay, feeding experiments with 5 lots of 10 sheep each were undertaken to determine whether its quality was as much affected as its appearance. The hay selected was mixed clover and rye grass grown on unmanured land; early-cut hay from a field top-dressed with 224 lbs. of nitrate of soda per acre; late-cut, but better cured, hay from a field manured as above; rowen, chiefly rye grass, from top-dressed land; and rowen, chiefly clover, from unmanured land.

The sheep fed rowen hay were given 0.5 lb. per head per day in addition to roots and concentrated feed. The others were given 2 lbs. of hay per head per day with roots, concentrated feed, and a little molasses. In the 105 days of the test the gain

ranged from 1.75 lbs. per sheep in the lot fed the early-cut hay from the top-dressed field to 2.06 lbs. in the case of the sheep fed clover rowen. Five animals in each lot were thought sufficiently fat for slaughtering.

According to the author "no difference in feeding value was found between hay (main crop) that had been dressed with nitrate of soda, and hay from unmanured land in the same field. Top-dressed hay cut 14 days before the usual time proved no better than similar hay cut at the usual time. Early cutting considerably reduced the crop." As regards the feeding value of the 2 sorts of rowen, in the author's opinion, additional experiments are needed before more definite conclusions can be drawn.

Experiments in feeding sheep under cover, T. H. MIDDLETON (*County Council Northumberland, Education Com., Rpt. 1903, pp. 69–71*).—Thirty-one sheep fed in an open shed made an average gain of 0.168 lb. per head per day and 30 sheep fed out of doors gained 0.189 lb. per head per day, both lots being fed similar rations of Swedish turnips, meadow hay, and mixed grains.

According to the author "though sheep do well under cover, when housed in the autumn it is better to finish half-fat shearlings in a grass field than in a shed, should bad weather at midwinter compel the farmer to take them off turnips. As might be anticipated, sheep that have spent half the winter in the open take a considerable time to get accustomed to a covered yard, and if an early sale be contemplated, the benefits of shelter are likely to be more than counterbalanced by the restlessness of the sheep in their new surroundings."

The feeding of sheep with gluten feed and other feeds, D. A. GILCHRIST (*County Council Northumberland, Education Com., Rpt. 1903, pp. 83–85*).—Using 3 lots each containing 10 grade wethers, the comparative value of gluten feed, split peas, and a mixture of equal parts of barley meal and undecorticated cotton-seed cake was studied, 0.75 to 1 lb. of the concentrated feeds being fed daily in addition to a basal ration of 10 lbs. of Swedish turnips and 0.75 lb. hay. The 3 rations had practically the same feeding value. At the beginning of the test the sheep averaged 114.4 lbs. each in weight. In 3 months the average daily gains per head were 1.36 lbs. on barley meal and cotton-seed cake, 1.47 lbs. on split peas, and 1.76 lbs. on gluten feed.

As regards the financial returns, in the author's opinion, all the 3 lots were satisfactory. The greatest profit, $1.26, was obtained with the lot receiving the gluten feed.

The feeding value of different varieties of swedes, D. A. GILCHRIST (*County Council Northumberland, Education Com., Rpt. 1903, pp. 86–91, dgm. 1*).—The comparative feeding value of Arctic (12.22 per cent dry matter), X L All (11.58 per cent dry matter), and Best of All Swedish turnips (11.55 per cent dry matter) was studied with 3 lots each containing 10 grade wethers averaging about 110 lbs. in weight. All the sheep were fed from 0.25 to 1 lb. of decorticated cotton-seed cake and maize meal 1:1, 0.5 lb. of hay, and 16 lbs. of Swedish turnips per head daily. The average gains per sheep per week in the 16 weeks of the trial were 1.387 lbs. on Best of All, 1.45 lbs. on X L All, and 1.731 lbs. on Arctic swedes.

"The financial results show satisfactory profits in each case, but the profit is nearly 40 per cent greater from Arctic swedes, which contain the largest amount of solid matter."

The investigation indicates "that a high percentage of solid matter in swedes is of great importance, and is likely to increase the feeding value of the swedes to a much greater extent than the proportionate increase of solid matter."

The improvement of permanent pastures, T. H. MIDDLETON (*Cambridge [England] Univ., Dept. Agr., Rpt. Expts. Crops and Stock 1903, pp. 3–18, fig. 1*).—In continuation of previous investigations (E. S. R., 14, p. 798), the improvement of pastures under various systems of manuring was tested by pasturing sheep on sample plats.

In the experiment in Cambridgeshire the largest gain, 174.4 lbs., was made by sheep on the pasture which had been manured with 1,120 lbs. of basic slag in the autumn of 1899. The smallest gain was 77.3 lbs. made by the sheep on the unmanured plats.

In the test carried on in Essex on stiff clay soil the greatest gain, 160.9 lbs., was also made on the plat which had been manured with 1,120 lbs. of basic slag per acre. The smallest gain, 46.5 lbs., was made on the unmanured plat.

The gains during the 4 months covered by the experiments in Norwich ranged from 198 lbs. with the sheep pastured on the plat manured with 1,568 lbs. of superphosphate to 369 lbs. with the sheep on the plat manured by feeding a mixture of linseed and undecorticated cotton-seed cake.

Some of the general conclusions which were reached follow: "When the pasture is situated on a clay soil, contains small clover plants, and is but scantily covered with grass, then the best results will usually be got from the application of heavy dressings of phosphatic manures (for example, dressings of from 8 to 10 cwt. of basic slag per acre). . . . When the pasture lies on a light and sandy soil, or when the sward is thick and close and the herbage is largely composed of strong grasses . . . [the most satisfactory manure] is a nitrogenous one, but nitrogenous manures must be used with great caution, for they are apt to stimulate the stronger and the coarser grasses, and in this way to secure quantity at the expense of quality. . . . To the grass and mixed herbage of light and medium soils no manure is likely to be so grateful as the droppings of animals fed upon the land, and the surest way to improve the condition of the pasture is to employ cotton cake or similar feeding stuffs to supply nitrogen, with light dressings of superphosphate and of kainit if it be proved that the land is in need of these mineral manures."

The formation of new pastures, experiment at Waresley, T. H. MIDDLETON (*Cambridge [England] Univ., Dept. Agr., Rpt. Expts. Crops and Stock 1903, pp. 19–26*).—The effect of different manures on pasturage was tested with sheep grazed on sample plats, the test being a continuation of earlier work (E. S. R., 14, p. 798). The greatest gain, 91.5 lbs., was made by the lot on a pasture which had been fertilized by feeding linseed cake. The smallest gain, 55 lbs., was made by the lot pastured on the unmanured land. In the author's opinion none of the sheep made satisfactory gains. The unmanured land was inferior to the other plats throughout the entire season.

Sheep-feeding experiment, T. H. MIDDLETON (*Cambridge [England] Univ., Dept. Agr., Rpt. Expts. Crops and Stock 1903, pp. 87–91*).—The relative value of gray peas, gluten feed, and gram or chick-peas (*Cicer arietinum*) was tested with 3 lots of 10 sheep each. The rations consisted of 1.25 lbs. of concentrated feed per head per day in addition to clover hay and roots. At the end of 32 days 5 animals from each lot were sold for slaughtering, the remainder being fed for 28 days longer. The average gain for the whole test was 14.1 lbs. per head on gray peas, 15.1 lbs. on gluten feed, and 15.8 lbs. on chick-peas. Under the experimental conditions none of the rations was considered profitable.

"The sheep did not much care for gluten feed, but they consumed the daily ration throughout the experiment. The other foods, especially the gram, were readily eaten." Gluten feed "is too dusty to be fed alone; it would do very well if mixed with a feeding cake. If used for feeding outside, the boxes containing it should have some cover, otherwise it will form a paste in wet weather and in this condition sheep will not eat it.

"Gram makes a useful feeding stuff for sheep. It may be fed whole or split. The animals are fond of it and there is no waste."

The author points out that chick-peas form the usual grain ration of horses in northern and western India and that chick-pea fed mutton is considered a delicacy in that country.

Lamb-feeding experiments, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 90, pp. 217–222*).—In continuation of earlier work (E. S. R., 12, p. 73) 3 tests with lambs are reported comparing cowpea hay with mixed timothy and clover hay. In the first test 37 lambs weighing 2,340 lbs. gained 270 lbs. in 6 weeks on a ration of cowpea hay and shelled corn. A second lot of 37 lambs weighing at the start 2,352 lbs. gained 48 lbs. on a ration of mixed timothy and clover hay and corn, while a lot of 20 lambs weighing 1,052 lbs. at the start and badly affected with stomach worms lost 12 lbs. in the same period on a ration of cowpea hay and corn. The authors calculate that with the cowpea ration a pound of gain cost 6.79 cts., and with a mixed hay ration 51.77 cts.

In the second test, which covered 9 weeks, a lot of 26 lambs weighing 1,910 lbs. at the start gained 378 lbs. on a ration of cowpea hay and shelled corn, while a similar lot fed mixed timothy and clover hay and shelled corn gained only 223 lbs., the cost of a pound of gain in the 2 cases being 5.27 cts. and 9.52 cts.

The third test was made with 2 lots of 37 lambs each, the total weight of each lot being about 2,280 lbs. In 73 days lot 1 fed cowpea hay and corn gained 495 lbs. and lot 2 fed mixed timothy and clover hay and corn gained 200 lbs., the cost of a pound of gain in the 2 cases being 3.32 cts. and 16.84 cts. In this and the other cases the total amounts of feed consumed were recorded.

According to the authors—

"Valuing the cowpea hay at $5 per ton, the mixed hay at $10, and the corn at 1 ct. per pound, then the lambs which received cowpea hay were fed each year at a profit, while those receiving mixed hay were profitable in only one instance.

Practically none of the lambs gained in weight as rapidly as they should. This was due partially to the presence of internal parasites, which interfered with the process of digestion and assimilation, and partially to the inbred and debilitated flocks prevailing in this section from which the lambs were derived."

The hog industry, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 47, pts. 1, pp. 96; 2, pp. 97–192; 3, pp. 193–298, maps 3*).—This bulletin constitutes an exhaustive summary of data relating to the pig-feeding industry in America, the topics discussed being selection, feeding, and management; recent American experimental work in pork production; and statistics of production and trade.

As regards suitable conditions, "the first place in hog raising in the United States is easily with the corn-growing sections, and here corn is the first grain thought of when the fattening of animals, especially hogs, is mentioned. It is, however, fallacious to argue that hog feeding will not give profitable returns outside of the corn belt. . . . Any locality that will grow clover of any species, that is favorable to the production of alfalfa, peas, or beans, where grains are readily grown—not only corn, but barley, wheat, oats, or rye—will be a favorable situation for the successful production of pork. If it is a locality where dairying is common, no better advantages are required; for, given leguminous pasture—clover, alfalfa, peas, beans, etc.—as a basis, with a grain feed that can be readily grown and also dairy by-products, the very highest grade of pork can be produced at a minimum cost."

In the selection of breeding stock, available data show that in actual practice "the man who feeds for the market recognizes, not breed, but type. . . . [Color and other characteristics vary] but on the points that represent the real meat-yielding parts of the animals the standards are almost identical. Breeders look for quality, depth, length, and width of form and depth and condition of flesh, regardless of whether their hogs are black, red, or white. At first sight breeds of the bacon type seem to be exceptions to this rule, but as yet there is not in the United States what can be called a general market class for hogs of this type. . . . At present (1902) the hog that sells for the highest price on the markets of the central West is the hog of the lard type." The conformity of breeds to common standards is shown by data compiled from score cards of the National Association of Expert Judges on Swine.

Among other points regarding the feeding and management of pigs, the author discusses the proper time for weaning on the basis of information secured from a large number of pig raisers. Although breeders differed widely, the majority favored weaning at 6 to 10 weeks of age.

In the section dealing with experimental pork production, the investigations carried on at the experimental stations in Canada and the United States are summarized and discussed. Comparing ground and unground corn the average results, judged purely on the basis of feed required per pound of gain, are in favor of corn meal, 4.79 lbs. of the meal being required as compared with 5.24 lbs. of the whole grain. When the cost of grinding is taken into account the advantage is not so obvious, and the conclusion was reached that "it is beyond anyone to say that an advantage may be expected to follow the feeding of corn meal sufficient to pay the cost of grinding." When other small grains were considered the results summarized showed a wider variation between the value of the ground and unground grains than in the case of corn, and the results were more uniformly favorable to grinding. In the case of wet and dry feed the average results showed an advantage of a little over 2 per cent in favor of soaking.

A summary of the experiments with cotton-seed meal shows that the cause of the poisonous symptoms, which often follow its use, is not definitely known. "Points that may in time lead to the discovery of the trouble are that old meal seems to be more fatal than fresh, that cotton-seed meal is more fatal than cotton seed in any condition, and that the poisonous agent is not in the oil, but seems to be entirely left in the cake when the oil is expressed. It is also well known throughout the South that decomposed cotton seed has little, if any, dangerous character, and it has been pretty clearly established . . . that the meal is so changed by the processes of digestion that hogs following steers which are being fed a heavy cotton-seed meal ration are not injured by the droppings." As regards the feeding value of cotton-seed meal, the results of different investigators have not been uniform.

The value of commercial by-products, dairy by-products, pasture and pasture substitutes, and similar topics are also discussed, as well as tests which have to do with feeding for bacon production.

In addition to census returns the section devoted to statistics of pork production and trade includes statistics of domestic, foreign, and miscellaneous trade in pork and pork products. A large amount of the statistical material is based on data gathered by the Bureau of Animal Industry. The bulletin contains a complete index.

Skim milk for pigs, G. H. True (*Arizona Sta. Bul. 47, pp. 300–302*).—According to the author 2 pigs weighing 81 lbs. following steers and fed 6,000 lbs. of skim milk in addition in 113 days gained 248 lbs. and increased $16.12 in value. In the form of pork the skim milk was worth 26.8 cts. per 100 lbs.

In another test, which is briefly reported, pigs fed skim milk in addition to alfalfa and barley gained 1.48 lbs. per head per day. Those fed skim milk and alfalfa 1.32 lbs., and those fed skim milk and barley 1.32 lbs., while those fed skim milk only gained 1.05 lbs. The feeding period covered from 19 to 49 days. The estimated value of the skim milk, judged from the returns in pork, ranged from 18.2 cts. in the case of the pigs fed skim milk only to 28.4 cts. in the case of those fed skim milk and alfalfa.

Alfalfa and skim milk v. alfalfa, skim milk, and barley as rations for growing pigs, T. F. McConnell (*Arizona Sta. Rpt. 1903, pp. 337–341*).—A lot of 5 pigs hurdled on alfalfa and fed skim milk with barley in addition made a total gain of 58.8 lbs. each in 10 weeks. Four pigs fed in a similar way without barley gained 43.5 lbs., the weight of the pigs in each case at the beginning of the trial being about 105 lbs. per head. Lot 1 (fed grain) required 9.23 lbs. of skim milk, 4.73 lbs. of rolled barley, and the alfalfa grown during the experimental period on 105.11 sq. ft. to produce a pound of gain. In the case of the lot fed no grain 16.45 lbs. of skim

milk and the alfalfa grown on 162.5 sq. ft. of land were required per pound of gain. According to the author, the pigs fed only alfalfa and skim milk did not have as firm flesh as the others; furthermore, the digestive organs were more distended and "in every way their condition indicated a larger percentage of offal with a smaller percentage of marketable flesh."

In this test one of the so-called "hog tamers" was employed to prevent the pigs from rooting. This device the author considers "entirely successful and much to be preferred to the hog-ring."

Feeding farm horses and mules, C. W. BURKETT (*North Carolina Sta. Bul. 189, pp. 99–127*).—Using horses and mules belonging to the college, feeding tests were undertaken to compare local grown feeding stuffs with each other and with purchased feeds. In general the tests were so arranged that the rations compared were fed at the same time to each of a pair of animals performing like work under uniform conditions. The principal feeding stuffs studied were bran, cowpea hay, gluten meal, corn-and-cob meal, shelled corn, corn silage and stover, cowpeas, cotton-seed meal, animal meal, and blood meal, 59 rations being tested.

According to the author the test as a whole showed that the forage crops grown in North Carolina are adapted to horse feeding, being efficient, easily grown, and available for every farmer, and that it is not necessary to purchase feeding stuffs outside the State.

"Cowpea hay is a valuable horse feed. Combined with corn-and-cob meal it makes a practical working ration. It can also be substituted for bran and oats, providing a reasonable quantity of corn is added to the daily ration."

As an example of the successful use of cowpea hay it was found that 2 mules weighing about 1,000 lbs. each maintained their weight for a period covering about 2 months on a ration of 10 lbs. of cowpea hay, 1.5 lbs. of cotton-seed meal, and 15 lbs. of corn-and-cob meal, the average cost per day being 19.5 cts.

"Corn ensilage is a superior feed for horses and mules. One of the most satisfactory rations fed in this series of experiments was composed of 21 lbs. of ensilage, 15 lbs. of corn, 2 lbs. of bran, and 1 lb. of cotton-seed meal. The ration was cheap, efficient, and wholesome to the animals. Corn stover is a roughage material that is exceedingly valuable for feeding farm horses and mules. It is a good substitute for hay for the winter feeding of horses and mules because of its feeding value, the yield per acre, and commercial value.

"Oat hay when cut while in the milk state is a satisfactory horse feed. When thus harvested it compares favorably with clover hay and cowpea hay."

Rations containing 10 lbs. of oat hay with 1 pound of cotton-seed meal, 10 lbs. of corn-and-cob meal, and 5 lbs. of bran or oats were found to be satisfactory in a test covering about a month made with 2 mules weighing nearly 1,000 lbs. each. The bran ration was regarded as somewhat superior to the oat ration and was also the cheaper.

"Cotton-seed meal can be used to replace a part of the corn or oats in a horse or mule ration. Two pounds of cotton-seed meal as a part of the daily rations were fed to horses and mules with satisfaction. This quantity can be fed in a mixture with either grain or sprinkled on ensilage or on hay or stover that has been moistened previously to feeding. In comparison with other feeding stuffs cotton-seed meal, because of its high feeding value, is a relatively cheap feed. Corn stover, corn, and cotton-seed meal, because of feeding and commercial values, make satisfactory rations for winter feeding of horses and mules, or at other times when on light or moderate work. Some of the animals in these experiments did not at first relish cotton-seed meal. Where animals can be made to acquire the taste it should be made a part of the daily ration.

"Tankage and dried blood were used in these tests satisfactorily. The latter is especially valuable when horses are 'run down' and thin in flesh."

As an example of the use of tankage a test covering 3 weeks, and made with 2 horses weighing not far from 1,300 lbs. each, may be mentioned, in which 2 lbs. of this material with 4 lbs. of bran, 10 lbs. of corn-and-cob meal, and 30 lbs. of corn silage was compared with a similar ration in which 15 lbs. of clover hay replaced the corn silage, the relative cost of the 2 rations being 18.5 cts. and 23 cts. Both rations were considered satisfactory. The same may be said of 2 rations containing dried blood which were tested for about a month with 2 mules weighing somewhat under 1,000 lbs. each. The first ration was made up of 1 lb. of dried blood, 25 lbs. of corn silage, 10 lbs. of corn-and-cob meal, and 4 lbs. of bran, the cost being 16.5 cts. The other ration was made up of the same constituents except that 10 lbs. of clover hay replaced the corn silage. The cost in this case was 19 cts.

The author considers that further tests are necessary to demonstrate the extent to which dried blood and tankage may be most efficiently fed.

"Bran was used as a substitute for oats and for corn acceptably and successfully. When it can be obtained at a moderate cost it should always find a place in feeding work animals. When corn and oats, though home-grown, are high commercially, it is often economy to sell part of the corn and oats in exchange for bran, providing the latter is not likewise temporarily high in market value.

"When the whole ear is ground, making what is termed here corn-and-cob meal, the same efficiency in work and maintenance of weight in horses and mules follows as where an equal quantity of shelled corn is fed. When corn on the ear was compared with an equal quantity of corn ground, the cob included in the latter, the difference was in the favor of the corn-and-cob meal, when corn stover was used as a roughage. When clover hay was used as a roughage the difference is not sufficient to note. Whether corn shall be ground or not will depend on the cost in labor and trouble in performing the operation.

"When wheat and cowpeas were compared as a part of the grain ration, cowpeas were equal to wheat, or slightly better. The cost of production and commercial value must always be considered when either is to be fed in connection with or as a substitute for other concentrates. Cowpeas are a satisfactory substitute for oats in feeding farm horses and mules."

In one of the tests cowpeas were compared with oats, 4 lbs. of each of these feeds being added to a basal ration of 4 lbs. ground wheat, 4 lbs. corn-and-cob meal, and 14 lbs. meadow hay, the cost of the oat ration being 24.4 cts. and of the cowpea ration, 20.4 cts. In the 2 weeks of the test the 2 horses, which weighed at the beginning not far from 1,100 lbs. each, gained a little in weight.

"Various kinds of feeding stuffs can be used to advantage and with economy in feeding farm horses and mules. There is no so-called 'one ration for horses.' A mixture of corn and bran, or of corn and cowpeas, or of corn, bran, and cotton-seed meal, is a good substitute for corn and oats in feeding work animals. Any feeding stuff or combination of feeding stuffs that furnishes the necessary and desirable nutrients at least cost should be the important consideration in the preparation of rations for farm horses and mules."

Poultry experiments, J. H. STEWART and H. ATWOOD (*West Virginia Sta. Bul. 88, pp. 147–162, pl. 1*).—The effect of feeding ground and moistened grain and also of light and heavy rations on egg production and egg fertility was studied. The first test was begun December 1, 1902, with 3 lots each containing 20 single-comb White Leghorn pullets and 2 cockerels and covered 240 days. All the lots were fed practically the same amount of grain (corn, wheat, and oats) and beef scrap, lot 1 being given ground grain and lot 3 whole grain only, while in the case of lot 2 one-third of the grain ration was ground and two-thirds fed whole. The total grain eaten per lot was approximately 1,000 lbs., and the total beef scrap 64 lbs., all the birds gaining somewhat in weight.

The total egg production in the case of lot 1 (ground grain) was 1,817 eggs, with lot 2 (ground and unground grain) 1,804 eggs, and with lot 3 (whole grain), 1,657

eggs. As shown by tests with different sorts of incubators, the eggs laid by lot 1 (ground grain) hatched slightly better than those from either of the other lots, but in the author's opinion this was due to the fact that the pullets were fed grain in the form of a mash. The eggs laid by lot 2, fed some ground grain, should have hatched better than those laid by lot 3, feed all whole grain, but such was not the case. The observed facts are explained on the ground that the pullets in lot 1 were relatively heavier than those in the other lots.

The relative merits of heavy and light rations were tested with 2 lots each containing 12 Rhode Island Red pullets, 8 2-year-old hens, and 2 cockerels. During the test, which began in December and covered some 7 months, lot 1, fed a heavy ration of grain and beef scraps, laid a total of 1,139 eggs and lot 2, fed a light ration of similar character, laid 930 eggs, the total amount of feed consumed in the 2 cases being 1,056.5 lbs. and 857.4 lbs. Data are also recorded regarding the weight of the poultry during the test proper and a month's preliminary feeding. As shown by the average of a number of tests with incubators, 66.8 per cent of the eggs from lot 1 (heavy ration) which were tested hatched as compared with 55.9 per cent of those from lot 2 (limited ration).

In another test made under practically the same conditions with 2 lots, each containing 20 White Leghorn pullets and 2 cockerels, and covering 166 days, lot 1 laid 1,358 eggs, consuming a total of 954 lbs. of grain with some beef scrap, while lot 2 laid 1,028 eggs, consuming 709 lbs. of the same feed as lot 1. In this case also incubator tests showed that the eggs from liberally fed fowls hatched better than those from fowls fed a limited ration.

"The results of these two tests should be construed as indicating that when the conditions are favorable for normal egg production, then the eggs will hatch better than when the conditions are unfavorable. On the other hand, it is quite probable and substantiated by experience, that breeds that are less active than the Leghorn, when supplied too liberally with food, become so fat that neither do the eggs hatch well nor are the chicks strong and vigorous."

The comparative fertility of eggs laid by hens, included in a previously reported test (E. S. R., 14, p. 902) on the comparative value of beef scrap, ground meat and bone, and milk albumen as sources of protein, were also studied. No material differences were observed which could be attributed to the feeding stuffs tested.

The effect of different feeding stuffs on the color of egg yolks and the flavor of eggs was studied, the grains included being corn, wheat, oats, Canada field peas, cowpeas, soy beans, peanuts, and sunflower seed. The flavoring materials used were trimethylamin, celery oil, and sassafras oil. Beef scrap constituted part of all the rations except in one case, where it was replaced by smoked herring. The green feed consisted of sugar beets, which it is said were readily eaten.

"Quite contrary to expectations the flavor of the eggs was not noticeably altered by any of the rations or flavoring materials employed. . . .

"The different rations, however, very clearly affected the color of the yolks. When the grain ration consisted of wheat, oats, or white corn, fed either alone or in combination with each other, the yolks were so light colored that the eggs would be quite unsuitable for fancy trade. When the grain supply consisted entirely of white corn, the yolks were very light colored, while on the other hand, the feeding of yellow corn imparted to the yolks that rich yellow color which is so desirable."

The importance of mineral matter and the value of grit for chicks, W. P. Wheeler (*New York State Sta. Bul. 242, pp. 293–314*).—With a view to learning the value of different inorganic substances as part of a ration for young chickens with reference to the nutritive material which they supply and their value from a mechanical standpoint, 7 series of feeding experiments were undertaken. Usually the trials extended over 10 or 12 weeks and were begun with chickens 1 to 3 weeks old. In every case the groups studied were fed alike except for the mineral portion of the ration.

Two lots of chickens were fed whole and ground grains, green alfalfa, gluten meal, and blood meal. In addition 1 lot was fed 2 oz. of Florida rock phosphate and 1 oz. of fine white glass sand per 24 oz. of dry feed, the mineral substances being well mixed with the ground grain. Lot 2 was fed the same mineral matter except for the first 2 weeks of the test the amount of sand was doubled. About 30 per cent of the protein in the ration was supplied by animal food. In 10 weeks chicks in lot 1 gained a pound in weight for every 2.7 lbs. of dry matter in the food, exclusive of the Florida rock. The chicks in lot 2 required 3 lbs. of dry matter per pound of gain, the total cost of food per pound of gain in the two cases being 3.7 cts. and 4.1 cts.

Of the 2 lots included in the second group one was fed the same grain ration and mineral matter as mentioned above, while the other lot was fed the same grain, etc., the mineral portion of the ration consisting of 0.5 oz. of ground oyster shells per 24 oz. of food. Exclusive of added mineral matter a pound of gain in the 2 lots required respectively 3.6 lbs. and 3.8 lbs. of feed, the cost, including rock and shell, being respectively 5.2 cts. and 5.1 cts. It was noted that the lot fed oyster shells ate more feed and made greater and more rapid gains than the lot fed the ground Florida rock.

Two lots were fed a ration made up of grains, milling products, linseed meal, gluten meal, and green alfalfa. One of the lots was given an ounce of sand per 15 oz. of food and the other an ounce of ground Florida rock. The 2 lots required respectively 4.7 lbs. and 5.5 lbs. total dry matter per pound of gain, the cost of a pound of gain being 5.8 cts. and 7.1 cts. The lot fed the ground Florida rock consumed somewhat less food and made the larger growth.

In the fourth test 4 lots were fed a ration of grains, milling products, etc., similar to that just mentioned, the ash constituents of this basal ration constituting from 3.1 to 3.3 per cent of the total dry matter. One of the lots was fed sand; another ground Florida rock; and a third bone ash and oyster shells 2 : 1 in the proportion of 1 oz. to 10 oz. of grain in every case. The fourth lot received no extra mineral matter. The chicks in this lot required 5 lbs. of dry matter per pound of gain; those in the lot fed sand, 4.5 lbs.; the lot fed Florida rock phosphate, 4 lbs.; and the lot fed bone ash and oyster shells, 4.6 lbs. exclusive of added mineral matter in each case. The cost of a pound of gain ranged from 4.9 cts. with the lot fed the Florida rock to 7.4 cts. with the lot fed bone ash and shell.

The fifth trial was made with 3 lots fed a basal ration of grain and animal meal carrying a large proportion of ground bone. The ration was high in mineral matter, about 85 per cent of which was supplied from the animal meal and bone. The animal food also supplied about 44 per cent of the protein in the ration. One of the lots was fed 3 oz. of ground oyster shell and the second 3 oz. of sand per 28 oz. of dry feed, while the third received no additional mineral matter. With ground oyster shells 3.8 lbs. of food and with sand 3.4 lbs. of food were required per pound of gain, the cost in each case being 5.7 cts. and 4.1 cts. per pound. Similar values for the lot receiving no additional mineral matter were 3.7 lbs. and 4.9 cts.

The sixth test was made with 2 lots and the seventh with 4 lots. The basal ration contained no animal food but was made up of grain, green alfalfa, etc. Two lots were fed ground oyster shells, 2 lots Florida rock, one sand and one bone ash and ground oyster shell 1:1, the proportion of added mineral matter in each case being 1 oz. per 11 oz. grain feed. In the majority of cases the mineral matter constituted about 12 per cent of the total ration. Considering the 2 tests as a whole, the feed required per pound of gain ranged from 3.9 lbs. with one of the lots fed ground oyster shells and one fed Florida rock to 5.3 lbs. with one of the lots fed ground oyster shells. The cost of a pound of gain ranged from 4.8 cts. with one of the lots fed Florida rock to 6.8 cts. with one of the lots fed oyster shells.

The author's conclusions follow:

"The mixing of sand in the food—both in a ration containing animal food and one without—resulted in better health for the chicks and more efficient use of the food.

"The addition of raw, ground Florida rock phosphate and sand to rations both with and without animal food resulted in better growth and more efficient use of food than when sand alone was added.

"The addition of the ground rock to rations without animal food resulted in more rapid growth and more efficient use of food than the addition of sand alone.

"The addition of ground rock phosphate to rations both with and without animal food was followed by better growth, and on the whole from less food, than the addition of finely ground oyster shell.

"Food mixed with finely ground oyster shell was less healthful and less efficient than the same food mixed with fine sand.

"Mixing bone ash and ground oyster shell in the food resulted in more rapid growth than the mixing of sand alone. But injury attributed to ground oyster shell made the feeding less profitable."

Ash and grit for growing chicks, F. H. HALL and W. P. WHEELER (*New York State Sta. Bul. 242, popular ed., pp. 7*).—A popular summary of the above bulletin.

DAIRY FARMING—DAIRYING.

The dairy herd, G. H. TRUE (*Arizona Sta. Rpt. 1903, pp. 335–337*).—This is a yearly record of 6 or 7 cows for 3 years.

The Waldeck cattle, W. RITGEN (*Inaug. Diss., Univ. Jena, 1903, pp. 75*).—A descriptive account of the native breed of cattle in Waldeck and the surrounding region, with considerable statistical data.

Dehorning cattle, C. L. BEACH (*Connecticut Storrs Sta. Rpt. 1903, pp. 176–182, fig. 1*).—Observations were made on the influence of dehorning cows upon the yield and composition of milk. In 1898 11 out of 24 cows in the herd were dehorned in May and the entire herd turned out to pasture on the following day. As compared with the cows not dehorned, the total loss of milk for the dehorned cows amounted to 127.08 lbs. during the first 10 days following dehorning, 66.47 lbs. during the second period of 10 days, and 11.73 lbs. during the third period of 10 days. In May, 1903, 9 cows were dehorned, records being obtained for the week preceding dehorning and for the 6 weeks following. The cows were pastured after the first 2 weeks. As compared with the yield of milk from the same number of cows not dehorned, the total loss of milk for the dehorned cows was 173.2 lbs. for the first week, 156.1 for the second week, 79.8 for the third week, 85.5 for the fourth week, 93.4 for the fifth week, and 51.3 for the sixth week. In 1898 the average loss of milk was 20 lbs. per cow, and in 1903, 70 lbs. The corresponding losses in butter fat were, respectively, ⅓ lb. and about 2 lbs.

"The pain of the operation of dehorning has been overestimated, and the mortality is practically nothing. The shrinkage in the milk and butter-fat yields of dairy cows is small and temporary. The worry, pain, and cruelty of animals to their mates is eliminated when these instruments of torture are removed, and the lack of fear and the quiet contentment of the individuals of the herd are at once noticeable. The benefits from dehorning dairy cattle can not be accurately measured, but there is an almost unanimous opinion in its favor among those who have practiced it in their herds."

Milking records, C. L. BEACH (*Connecticut Storrs Sta. Rpt. 1903, pp. 183–186*).—Data are given which show the amount of milk obtained by a second milking immediately following careless or unskillful milking. The additional milk from 6 cows amounted to 22.35 lbs. and tested 10.6 per cent of fat. A score card used in judging the efficiency of students in milking is also given.

Contribution to the study of the influence of milking on the composition of milk, L. Lepoutre (*Bul. Agr.* [*Brussels*], *20* (*1904*), *No. 1, pp. 91–117*).—The influence of different methods of milking upon the fat content of the milk was studied in experiments with 4 cows. When each quarter of the udder was milked separately the fat content of the milk from the quarter milked first was almost invariably higher than that of the milk from the quarter milked last. For instance, the percentage of fat in the milk from the posterior right, anterior right, posterior left, and anterior left quarters milked in the order mentioned were, respectively, 4.4, 2.5, 2.4, and 2 per cent.

When this order was changed and the posterior left, anterior left, posterior right, and anterior right quarters were milked in the order named, the figures were, respectively, 4.8, 2.6, 2.5, and 2.2 per cent. Likewise the milk from 2 quarters, a posterior and an anterior, milked first and at the same time showed a higher fat content than the milk from the 2 remaining quarters milked last. This difference was less marked when diagonally opposite quarters were milked at the same time than when the 2 right or the 2 left were milked together. The data for the experiments are reported in detail. The physiology of milk secretion is discussed briefly, but no definite explanation of the results obtained is offered.

In the milk from one quarter obtained in 6 portions during the entire milking the fat content increased from 3.1 to 6.8 per cent, the total solids increased from 12.59 to 15.23 per cent, and the ash decreased from 0.78 to 0.73 per cent.

Comparative tests of four methods of milking made at the dairy station in Belgium, A. de Mestral (*Bul. Agr.* [*Brussels*], *20* (*1904*), *No. 1, pp. 118–124*).—The method of milking in ordinary use, the Swiss method, the ordinary method or the Swiss method followed by a supplementary milking within 15 to 30 minutes after the first, and the Hegelund method were compared. The experiments were made with 3 cows and covered a period of 2 months. While the results were not sufficiently conclusive to show the relative value of the different methods, they indicated, however, that the ordinary method was much inferior to the other three.

Variations in the composition of milk and their probable causes, D. A. Gilchrist (*Newcastle-upon-Tyne: Northumberland and Durham Dairy Farmers' Assoc.*, *1903, pp. 16*).—This is a brief report upon the examination of a large number of samples of milk of individual cows, and also of mixed milk, 6 herds being represented and the tests extending over periods of 1 to 12 months. In collecting the samples data were obtained on the breed of cows, times of milking, weather conditions, and rations. It was found that morning's milk was frequently below the standard of 3 per cent of fat when the previous milking was early in the afternoon.

As a remedy for this it is suggested that the cows be milked 3 times a day, the last milking being late in the evening and the milk kept in the best condition possible over night. Even with equal intervals between milkings the fat content of the milk of individual cows frequently fell below the standard. With one or two exceptions, the marked changes in the feeding of the different herds while the tests were in progress did not materially affect the quantity or the quality of the milk. Weather conditions, on the contrary, apparently exerted a very important influence on milk production. The influence of other causes, such as the temperament of the cow and regularity in time and manner of feeding, are also considered.

Variation in the milk of a dairy herd during the summer months, T. S. Dymond and B. W. Bull (*Essex Education Com., County Tech. Labs., 1904, Mar., pp. 15, dgms. 2*).—A record is given of 5 shorthorn cows for 2 weeks each month from May to September, inclusive. Notes are also given on weather conditions. The results are compared with those of a similar study made during the winter months and previously reported (E. S. R., 15, p. 74). The conclusions were drawn in the earlier paper that variations in the composition of milk are due mainly to idiosyncrasies of cows over which no control can be exercised, and that there is little danger of the mixed milk of a herd falling below the legal standard in England.

Other causes of minor importance, such as food, temperature, unequal intervals between milkings, etc., were mentioned. In the present paper data are also given showing variations occurring during the period of heat. In the winter the decrease in yield per month was about 5 per cent; in the summer it was nearly 10 per cent. In general the fat content of the milk increased as the yield decreased. In July there was a decrease in the solids-not-fat in the milk of every cow. While the fat and solids-not-fat were frequently below the standard in the case of individual cows, this was not true of the mixed milk of the 5 cows in any instance.

The mineral constituents of cows' milk and their variations during the period of lactation, A. TRUNZ (*Ztschr. Physiol. Chem., 40 (1903), No. 3–4, pp. 263–310*).—The author reviews the literature concerning the mineral constituents of milk, and reports determinations of the total ash and the different ash constituents in the milk of 2 cows at frequent intervals during the entire lactation period. Determinations were also made of the specific gravity, fat, total proteids, casein, albumin and globulin, and milk sugar.

Cow No. 655 was 3½ years of age at the beginning of the lactation period, which lasted from December 25, 1901, to November 8, 1902. Cow No. 674 was 7½ years old at the beginning of the period, which lasted from January 14 to December 6, 1902. The course of lactation in both instances was considered normal. The accompanying table shows the total ash and the different constituents by months for each cow. In the percentages for pure ash as given in the table, deductions were made for the sulphuric acid and the phosphoric acid derived from the phosphorus of the casein.

Ash analyses of the milk of two cows.

	Total ash.	K_2O	Na_2O	CaO	MgO	Fe_2O_3	Cl	P_2O_5
Cow No. 655:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Colostrum period	0.705	24.61	7.14	29.27	3.58	0.48	11.67	25.66
January	.604	28.28	6.65	27.92	2.99	.42	11.89	24.56
February	.602	28.34	4.95	28.94	3.17	.40	12.82	24.26
March	.589	27.54	6.70	27.24	3.17	.38	13.02	24.82
April	.591	27.92	5.02	29.53	3.23	.42	12.52	24.18
May	.598	28.52	5.33	28.23	3.10	.51	10.62	26.05
July	.607	26.28	7.89	27.09	2.85	.50	13.13	25.23
August	.625	25.80	6.40	28.82	3.41	.40	16.97	22.03
September	.626	20.97	7.34	32.97	4.13	.40	14.31	23.10
October	.773	18.81	7.41	36.69	3.72	.46	13.01	22.85
Cow No. 674:								
Colostrum period	.684	25.68	7.48	26.48	4.15	.23	14.70	24.60
January	.650	29.27	7.44	24.76	3.05	.24	14.10	24.24
February	.633	28.43	6.35	25.65	3.38	.26	14.59	24.88
March	.663	27.82	6.28	25.43	2.85	.23	15.77	25.18
April	.658	28.50	7.10	23.50	2.73	.29	16.37	25.21
May	.699	26.86	6.51	25.59	3.05	.24	17.75	24.01
July	.706	26.07	7.54	26.18	2.93	.24	17.75	23.30
August	.699	26.93	5.83	25.44	2.77	.27	20.82	22.63
September	.711	24.74	8.15	25.56	3.15	.27	20.21	22.48
October	.718	23.85	9.34	25.60	3.29	.29	20.08	22.08
November	.728	25.27	8.54	26.17	2.76	.32	21.32	20.44
December	.855	15.26	19.31	23.27	3.87	.24	27.15	17.13

The influence of feeding stuffs on milk secretion and on the composition of milk, O. LEMMERMANN and G. LINKH (*Landw. Jahrb., 32 (1903), No. 4, pp. 559–625*).—In a review of the literature of this subject the authors found very little of a positive nature as to the existence of a feeding stuff having a specific influence on milk secretion. All the experiments which have indicated such an influence can not be looked upon as conclusive, according to the authors, on account of the manner in which the experiments were made.

Experiments with 4 cows were conducted for the purpose of determining if such an influence could be ascribed to palm-nut cake, cocoanut cake, brewers' grains, and a mixture of equal parts of anise, fennel, juniper, and caraway. The basal ration consisted of feeding stuffs not believed to have any specific influence on the yield and composition of milk. In all cases the rations contained the same amount of digestible matter.

The results, which are reported in detail, indicated that each of the feeding stuffs under examination exerted a specific influence outside of its food value, although this influence was not constant with the different animals. A feeding stuff which apparently exerted a specific influence with one animal was entirely without effect with another animal. On the other hand, the different feeding stuffs acted differently on the same animal. This specific influence consisted in increasing slightly the yield of milk, or in retarding the decrease in yield due to the advance of lactation. In all cases this influence was so small that it is considered of no practical importance. No dairy feeding stuff is therefore believed to justify a price in excess of its food value.

The influence of feeding stuffs on the character of the butter fat, O. Lemmermann and F. Moszeik (*Landw. Jahrb., 32 (1903), No. 4, pp. 626–634*).—In experiments with 7 cows a study was made of the influence upon the butter fat of sesame cake fed alone and of sesame cake, peanut cake, and palm-nut cake fed in different mixtures. In no instance was sesame oil detected in the butter by means of the Badouin reaction. The Reichert-Meissl number showed no variations which could be attributed to the influence of the different oil cakes. On the contrary, the refractometer and iodin numbers of the butter fat varied unmistakably with the corresponding numbers of the fats in the feeding stuffs. A direct influence on the character of the butter fat was, therefore, apparently exerted by the fat in the food. It is considered as the most obvious explanation that a portion of the fat in the food passed through the organism without undergoing much change.

The constituents of milk—their properties and changes, R. W. Raudnitz (*Separate from Ergebnisse Physiol., 2 (1903), pp. 136*).—This is a general review of the literature of this subject, the bibliography including about 670 references.

Contribution to the knowledge of goats' milk, P. Buttenberg and F. Tetzner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 270–272*).—The milk of 5 goats was analyzed morning and evening for 6 days. The fat content was frequently below 3 per cent and the solids-not-fat frequently below 8 per cent. The average composition of the mixed milk of the 5 goats for the 6 days was 3.04 per cent of fat and 8.15 per cent of solids-not-fat for morning's milk, and 3.67 per cent of fat and 8.19 per cent of solids-not-fat for evening's milk.

Preventing contamination of milk, W. J. Fraser (*Illinois Sta. Bul. 91, pp. 219–249, figs. 13*).—Brief notes are given on the sources of bacteria in milk and on the changes produced by bacteria in milk, and investigations conducted for the purpose of determining the effect of the different operations commonly performed in dairies and dairy barns upon the bacterial content of milk are reported.

Petri dishes having an area of about 63 sq. cm., and filled with an agar culture medium were exposed for different lengths of time, usually a half minute, under various conditions. In all 1,185 exposures were made. Only the average results are given in the bulletin. Some of these are summarized in the following table:

Average number of colonies developed from exposures made in different places.

Place of exposure.	Number of exposures.	Number of colonies.
Open field	43	0.9
Barnyard	51	13.0
Well-kept barn during milking	10	32.0
University barn during milking	46	38.0
Poorly-kept barn during milking	21	168.0
Barn empty, closed 3 hours	12	.6
Before feeding	9	46.0
After feeding	31	109.0
After brushing cows	38	307.0
Under apparently clean unwashed udder	158	578.0
Under washed udder	262	192.0
Bottling room	60	.3
Dairy room	3	15.0

The effect of feeding roughage and brushing cows was to increase the number of colonies from 46 to 109 and 307. The greatest source of contamination in milk was found to be the cow herself, and the greater part of this contamination was found to come from the udder. Washing the udder reduced the number of colonies on an average from 578 to 192. Determinations were also made of the amount of dirt falling from udders apparently clean, slightly soiled, and muddy during the time usually required for milking and with manipulations corresponding to those used in milking. With udders apparently clean the amount of dirt falling before washing was 3.5 times as great as that falling after washing; with udders slightly soiled the amount before washing was 18 times as great as that after washing; and with muddy udders the amount before washing was 90 times as great as that after washing, showing the decided advantage of washing udders before milking in the production of clean milk.

City milk supply, W. J. Fraser (*Illinois Sta. Bul. 92, pp. 251–272, figs. 9*).—The statements made in this bulletin are based upon the results of 7 years' experience in conducting a sanitary dairy at the University of Illinois and upon the results of investigations. Suggestions are made concerning the care of yards, construction and care of barns and stables, cleanliness in milking, care of milk and dairy utensils, standardizing milk and cream, and other matters requiring attention in the production of good milk.

Milk production at the University of Illinois (*Illinois Sta. Circ. 73, pp. 16, figs. 8*).—This is a description of the methods employed in the production of sanitary milk at the University of Illinois, and is distributed with the bulletin noted above as an illustration of the means that may be taken of informing the public of the methods employed in the production of good milk.

Comparison of bacteria in strained and unstrained samples of milk, H. W. Conn and W. A. Stocking, Jr. (*Connecticut Storrs Sta. Rpt. 1903, pp. 33–37*).—This series of experiments was designed to test the effect of straining upon the bacterial content and keeping quality of milk. The milk was drawn into an ordinary open pail, sampled, strained through 2 layers of sterilized cheese cloth and again sampled, plate cultures being made from the samples soon after taking, after being kept at a temperature of 70° F. for 50 hours, and at the time of curdling. Determinations of acidity were made at the end of 50 hours and at the time of curdling.

The results, which are tabulated, show on an average very little difference in the bacterial content of the strained and unstrained samples, and also very little difference in the time of curdling. The time required for curdling varied from 42 to 104 hours, the samples all being kept at the same temperature. This difference was apparently not due to the number of bacteria originally in the milk, as the sample curdling in the shortest time had at the outset the smallest number of bacteria. A slightly larger percentage of acid bacteria were present in the unstrained than in the strained samples, the difference, however, not being considered large enough to have any significance.

In general, samples showing the greatest number of bacteria at the end of 50 hours showed also the highest percentage of acidity. The number of bacteria present at the end of 50 hours seemed wholly independent of the number present at the outset. While the lactic-acid bacteria in fresh milk ranged from 9 to 53 per cent of the total number present, they constituted usually from 99 to 100 per cent at the time of curdling. The number of bacteria at the time of curdling varied from 211,000,000 to 2,700,000,000 and had apparently no relation to the time of curdling. The acidity of the milk at the time of curdling also varied greatly, and while usually it was from 0.6 to 0.8 per cent, in 2 cases it reached 1.15 and 1.23 per cent.

Strained and unstrained milk preserved at 70 and 50° F., H. W. Conn and W. A. Stocking, Jr. (*Connecticut Storrs Sta. Rpt. 1903, pp. 38–51*).—In continuation of the above experiments tests were made to compare the number and kind of

bacteria in milk when fresh and at a later period, to determine whether straining through cheese cloth exerts an influence upon the bacterial content of the milk, to study the relation between the number of bacteria and the development of acid, and to study the effect of a change in temperature upon the total number of bacteria and the relative number of the different types. The milk was obtained from one cow in the ordinary manner, and strained and unstrained samples were kept at temperatures of 50 and 70°.

Some of the general conclusions drawn from the tabulated data are summarized below:

The examination of the fresh milk showed that straining through cheese cloth had only a slight effect in removing bacteria, which was considered somewhat surprising, inasmuch as previous experiments had shown that straining in this manner removed about 40 per cent of the dirt present. Of the bacteria removed by straining the larger percentage consisted of nonacid species, although the results as a whole showed very little difference. The relative proportion of the acid and nonacid bacteria in fresh milk was, however, considered of little importance as regards the rapidity of curdling, inasmuch as the type of lactic-acid bacteria originally present was replaced in most cases by the end of 50 hours by *Bacterium lactis acidi*.

The examination of the milk kept for 50 hours at 70° showed that the strained samples contained on the whole a slightly larger number of bacteria than the unstrained samples. Neither the total number of bacteria nor the percentage of lactic-acid bacteria was believed to be influenced to any appreciable extent by straining. In cases where the acid bacteria had reached 99 per cent of the total number of bacteria present the acidity of the milk was not very greatly increased, indicating that the production of acid takes place rapidly only after the acid bacteria have gained full control. The development of acid bacteria was unaffected by straining. In general, samples containing the larger number of acid bacteria also contained the highest percentage of acid.

The examination of milk kept for 50 hours at 50° showed a striking reduction in the number of bacteria as compared with the milk kept at 70°, the average number in the samples kept at 70° being nearly 500,000,000 and at 50°, 6,000,000. The acid bacteria were reduced in greater proportion than the total bacteria. The strained samples contained slightly larger numbers of acid bacteria than the unstrained samples, although the difference was considered too slight to have any meaning. There was practically no increase in the acidity of the milk, the average acidity being about 0.20 per cent, while that of the original samples averaged 0.18 per cent.

At 70° the time required for curdling was 87 and 97 hours, while at 50° the average was about 300 hours, the unstrained samples keeping on an average about 10 hours longer than the strained samples. The time of curdling at 50° appeared to be unrelated to the total number of bacteria present at the outset. The conclusion is drawn that for practical purposes the temperature is of more importance in the keeping of milk than the original bacterial contamination. The number of bacteria present at the time of curdling varied from 282,000,000 to 1,659,000,000. The acidity also showed considerable variations.

Aseptic milk, H. W. CONN and W. A. STOCKING, Jr. (*Connecticut Storrs Sta. Rpt. 1903, pp. 52–62*).—This series of experiments, which is in continuation of the two series noted above, was designed to compare ordinary milk with milk obtained under exceptional precautions and here called aseptic milk. The precautions taken included the washing of the udder and flanks of the cow with a 3 per cent solution of boric acid and wiping with a sterilized cloth, the milker also washing his hands with the same solution and wiping them on a sterilized cloth. After the milking was half done these precautions were repeated, and milk was drawn into a sterilized covered pail through 4 thicknesses of sterilized cheese cloth and a layer of absorbent cotton and sampled for bacteriological examination. All the experiments were made with the

milk of one cow, which was obtained by the method outlined and by the ordinary method on alternate days. Samples were kept at 70° and at 50° F.

The extra precautions mentioned reduced the bacterial content of the fresh milk in two series of experiments from averages of 3,888 and 3,116 bacteria per cubic centimeter to 267 and 242, but apparently increased the percentage of lactic-acid bacteria. In no instance was the typical *Bacterium lactis acidi* found.

In the samples kept at 70° the bacteria multiplied more rapidly in ordinary milk than in the aseptic milk. The aseptic milk showed in practically every instance a smaller number of bacteria at the end of 12, 24, and 36 hours than milk drawn in the ordinary way. The development of acid was correspondingly much slower in the aseptic samples. Ordinary milk curdled, on an average, in 79 hours and aseptic milk in 113 hours.

In the samples kept at 50° the differences were even greater than in the samples kept at 70°. The average increase of bacteria at this temperature in 36 hours was 10-fold in the aseptic milk and 30-fold in the ordinary milk. The time of curdling was, respectively, 226 and 400 hours. It is considered that the most striking results of the experiments were the effect of a temperature of 50° in checking bacterial growth and in improving the keeping quality of the milk. The lower temperature checked the development of lactic-acid bacteria and favored the development of miscellaneous species.

Qualitative analysis of bacteria in market milk, H. W. Conn and W. M. Esten (*Connecticut Storrs Sta. Rpt. 1903, pp. 63–91*).—In continuation of investigations previously reported (E. S. R., 13, pp. 688, 987), bacteriological examinations were made of the market milk of Middletown, Conn. The milk was obtained from about 20 milkmen, and was supposed to be from 2 to 12 hours old. The methods of examination employed were the same as those previously described. The bacteria ordinarily found in normal milk are divided into 12 groups, each of which is described. Data for selected experiments are reported in this article, and a number of conclusions are drawn.

The number of bacteria varied from 8,000 to 2,900,000 per cubic centimeter. In a general way the percentage of lactic-acid bacteria increased with the total number. An increase in the total number of bacteria was associated with a decrease in the number of varieties. On the other hand, a small number of bacteria was associated, as a rule, with a large number of varieties. The liquefying bacteria in general varied inversely as the total number of bacteria, and also inversely as the percentage of lactic-acid bacteria. The liquefying bacteria also varied with the season, the number being greater during May and June than during the several months preceding. The number of varieties of bacteria varied greatly in the different samples, in some cases being only 4 or 5, while in others no less than 17 species were recognized.

Comparative tests were made of several modifications of the methods of study previously described and used in the above investigations. It has been found preferable to sterilize the litmus solution separately and add it to the gelatin at the time of using, thus securing a greater uniformity in the color of the medium. Three culture media—whey gelatin, peptone gelatin, and milk custard—were tried alone and in different mixtures. Part of the data for these tests are included in the report. The most satisfactory medium for all purposes, including both quantitative and qualitative analysis, has been found to be a mixture of the common beef peptone gelatin and the whey gelatin, litmus being added in a manner to secure uniformity of color in the different plates.

Bacteria in freshly drawn milk, H. W. Conn (*Connecticut Storrs Sta. Rpt. 1903, pp. 92–98*).—This is a comparison of the results obtained by Harrison and Cumming (E. S. R., 14, p. 907) with those obtained in Connecticut. In the work at Middletown and Storrs, Conn., the number of bacteria found in the fore milk has been much lower, the average of 70 experiments being 6,900 bacteria per cubic centimeter,

as compared with an average of 25,000 to 50,000 reported by Harrison and Cumming. The most striking difference, however, related to the species of bacteria present. In the work of Harrison and Cumming over 95 per cent of the bacteria were reported as belonging to the lactic-acid group and including *Bacterium lactis acidi*. In the work in Connecticut, involving hundreds of experiments carried on in the two localities mentioned, the lactic-acid bacteria were commonly less than 50 per cent and often below 30 per cent; and in practically no instance was the *Bacterium lactis acidi* present. The differences are attributed in part to local conditions, but mainly to the different methods of analysis used. The author attributes the discrepancies in results to the use by Harrison and Cumming of ordinary gelatin in the preparation of plate cultures and the subsequent isolation and study of only a limited number of colonies.

Dairy bacteriology laboratory, W. A. STOCKING, Jr. (*Connecticut Storrs Sta. Rpt. 1903, pp. 22–27, figs. 5*).—This is an illustrated description of the new dairy bacteriological laboratory at the Connecticut Storrs Station.

Milk bacteria, C. HAPPICH (*Fortschr. Vet. Hyg., 1 (1903), No. 4, pp. 149–151*).—The bacteria found in milk are classified as indifferent, useful, harmful, and pathogenic, and each class is described.

Milk fermentations, M. A. O'CALLAGHAN (*Agr. Gaz. New South Wales, 15 (1904), No. 2, pp. 111, 112, pls. 3*).—Notes are given on the use of boric acid in the preservation of normal milk, condensed milk, and concentrated milk. In experiments which are briefly reported the development of lactic-acid bacteria was very materially checked in fresh milk by the addition of 0.25 and 0.50 per cent of boric acid, while this quantity of preservative did not appear to retard butyric-acid fermentation in the slightest. In concentrated milk the use of 0.25 to 0.50 per cent of boric acid appeared to check the growth of nearly all species of bacteria.

The soluble ferments of cows' milk, J. LESPERANCE (*Med. Rec. [New York], 65 (1904), No. 12, pp. 447–450*).—This is a general discussion of the subject. In summarizing the discussion the author states that the presence of peptic, tryptic, lipasic, oxidizing, and glycolytic ferments in milk have been definitely determined. A bibliography is appended.

On the coagulation of milk, A. S. LOEVENHART (*Ztschr. Physiol. Chem., 41 (1904), No. 3, pp. 177–205*).—Some of the results of the investigations here reported may be summarized as follows: In regard to the action of their salts on casein and paracasein, metals may be divided into 3 groups—group 1 including sodium, potassium, ammonium, and possibly also rubidium and cesium, the salts of which precipitate neither casein nor paracasein; group 2 including the salts of lithium, beryllium, magnesium, calcium, strontium, barium, manganese, iron, cobalt, and nickel, which precipitate paracasein readily at room temperatures, but casein only after a long time at 40° C. or above; and group 3 including all the other heavy metals and ferric iron, the salts of which precipitate both casein and paracasein promptly at room temperatures. The precipitating action of the salts increased in proceeding from the stronger to the weaker metals.

Paracasein was precipitated more readily than casein by all the reagents. Paracasein and casein are believed to differ only in their physical nature, and are, therefore, modifications of one and the same substances. The coagulation of milk is believed for the most part to depend upon a change in the arrangement of the mineral constituents of milk. The calcium salts present in milk do not exist originally in a form capable of precipitating the casein or paracasein, but are made available for this purpose during the action of the rennet.

A study was made of the metacasein reaction of Roberts, which consists in the addition of pancreatic extract to milk by which the milk, while not apparently changed, is nevertheless rendered capable of being coagulated by heat. This was found to be directly dependent upon the presence of calcium salts, and could

also be obtained in other ways. It was believed to represent merely a stage in the process of coagulation. The transformation of the casein into paracasein was found to take place more rapidly than the liberation of the calcium salts, and was completed at the time of the appearance of the metacasein reaction. The calcium salts are made available during the period from the beginning of the metacasein reaction to the appearance of coagulation.

Supplying large cities with milk for infants. I, The necessity of a transformation in the production of milk for infants, M. SEIFFERT (*Die Versorgung der grossen Städte mit Kindermilch. I, Die Notwendigkeit einer Umgestaltung der Kindermilcherzeugung. Leipzig: Weigel, 1904, pp. 278, pls. 4*).

Progress in the field of the chemistry, hygiene, and bacteriology of milk and its products, WEIGMANN, HÖFT and GRUBER (*Chem. Ztg., 28 (1904), No. 19, pp. 229–232*).—A summary of the literature during 1903, 128 references being given in footnotes.

The technique of butter making in Denmark, M. BEAU (*Jour. Agr. Prat., n. ser., 7 (1904), No. 6, pp. 183–185*).—A brief description of the methods employed in making butter in Denmark.

Notes on the biology of anaerobic bacteria in cheese, A. RODELLA (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), No. 14–15, pp. 452–456*).—Brief notes are given on recent investigations relating to the growth of anaerobic bacteria. According to the author, anaerobic forms isolated from Emmenthaler cheese not only grow in a medium containing 0.5 per cent lactic acid, but even exert a liquefying action on the casein. This action, however, is much greater in an alkaline medium.

The utilization of skim milk in dairying, C. KNOCH (*Die Magermilch-Verwertung in den Molkereien. Leipzig: M. Heinsius Nachfolger, 1903, pp. 217, figs. 41*).—The composition of skim milk is discussed, and the different methods of utilization are described.

Dairying, C. MARTIN (*Laiterie. Paris: J. B. Baillière & Sons, 1904, pp. 380, figs. 114*).—This treatise constitutes one of the volumes of the *Encyclopédie agricole*. The different subjects included in dairying, such as the composition and properties of milk, bacteria in milk, care and handling of milk, milk inspection and sale, butter making, cheese making, cooperative societies, condensed milk, utilization of by-products, etc., are quite fully treated.

Dairying division, J. A. KINSELLA (*New Zealand Dept. Agr. Rpt. 1903, App. II, pp. 30–80, pls. 3*).—This report of the dairy commissioner comprises a summary of the work of the division during the year, statistical data relating to dairying in New Zealand, and suggestions for the improvement of the industry.

VETERINARY SCIENCE AND PRACTICE.

The present status of the doctrine of immunity, C. O. JENSEN (*Maanedsskr. Dyrlæger, 15 (1903), No. 7–8, pp. 253–269, figs. 17*).—In this article the author discusses the subject of immunity from a historical standpoint and reviews in a critical manner the contributions made to the subject by Pasteur, Metchnikoff, Buchner, Virchow, and Ehrlich.

Vitality and immunity, C. SCHULIN (*Jour. Comp. Med. and Vet. Arch., 24 (1903), Nos. 1, pp. 1–6; 2, pp. 77–88; 3, pp. 147–156; 4, pp. 233–240*).—A general discussion of the phenomenon of immunity with special reference to the physiological basis of vitality in animals. The literature relating to immunity is discussed from this point of view. The author believes as a result of his studies that pathogenic organisms are developed from saprophytic bacteria and that there is little stability of type in bacteria. These organisms are believed to be capable of adapting themselves readily to changed conditions.

Agglutinins and precipitants, A. WASSERMANN (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 2, pp. 267–292, fig. 1*). The author described the nature and properties

of agglutinins and precipitants in accordance with the recent theories regarding vaccination and immunity. Experiments were made on rabbits for the purpose of testing the relationship of agglutinins to other substances which are found in the blood serum.

The influence of high pressure on micro-organisms, G. W. Chlopin and G. Tammann (*Ztschr. Hyg. u. Infectionskrank., 45 (1903), No. 2, pp. 171-204*).—The author tested the influence of pressures varying from 500 kg. to 3,000 kg. per square centimeter upon the growth and virulence of various micro-organisms, including the bacillus of mouse typhus and the anthrax bacillus. The high pressure was brought about gradually and the normal pressure was then gradually restored. In experiments with the bacillus of mouse typhus it was found that the virulence of the organism was considerably reduced by subjection to a pressure of 2,000 kg. per square centimeter at a temperature of 36° C. In general the experiments showed that a considerable increase of pressure lowered the vital functions of micro-organisms and that these functions did not regain their normal state until after some time. A pressure of 3,000 kg. per square centimeter, however, was not sufficient to kill bacteria, mold fungi, or yeasts, and exercised only a slight immediate effect upon the micro-organisms. The effect was proportional to the length of period and to the pressure, and was manifested in weaker movements, less rapid multiplication, less active production of fermentation and pigments, and an attenuation of the virulence.

The death of bacteria when boiled under diminished pressure, J. Schut, Jr. (*Ztschr. Hyg. u. Infectionskrank., 44 (1903), No. 2, pp. 323–358, pl. 1, figs. 6*).—In these experiments a considerable variety of saprophytic and pathogenic bacteria, including anthrax bacilli, were used. The purpose of the experiments was to determine whether the lowering of the pressure influenced the effectiveness of a given temperature in the destruction of micro-organisms. It was found that bacteria and other spores are killed less quickly by subjection to a given temperature without boiling than by being boiled at the same time. Live steam was found to be more effective in the destruction of micro-organisms than boiling water at the same temperature. The experiments also showed that the resistance of micro-organisms to high temperature depends in part on the temperature at which they had been cultivated, and the medium in which they are suspended. Live steam was found to be practically as effective at a temperature of 90 as at 100° C.

Fourteenth annual report of the veterinary service in Hungary, F. Hutyra (*Jahresber. Vet. Ungarn, 14 (1902), pp. 135*).—As usual in his annual report, the author presents an account of the official veterinary service of Hungary, together with detailed notes on the prevalence and means of combating rinderpest, anthrax, rabies, glanders, epizootic swine diseases, tuberculosis, etc.

Report of the veterinary service in the Kingdom of Saxony for 1902 (*Ber. Veterinärw. Königr. Sachsen, 47 (1902), pp. 324*).—This report contains an account of the veterinary commission, the official veterinarians of Saxony, and notes on the work of the veterinary service on a great variety of animal diseases in different parts of the kingdom.

Annual report of the Bacteriological Institute for the Province of Saxony, H. Raebiger (*Berlin. Tierärztl. Wchnschr., 1903, No. 41, pp. 639–641*).—Notes are given on contagious vaginal catarrh of cattle and its treatment, infectious dysentery in calves, Borna horse disease, pleuro-pneumonia of cattle, swine erysipelas, swine plague, fowl cholera, and the destruction of rats by means of bacterial cultures.

Bloemfontein veterinary conference, S. B. Woollatt (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 23, pp. 841–843*).—At this conference a lengthy discussion on rinderpest was had and a resolution was adopted declaring that one of the most important points in preventing this disease is the making of an immediate and correct diagnosis, and that all of the governments represented at the conference should at once give notification of the presence of rinderpest in their country.

Attention was also given to a consideration of African coast fever in cattle, glanders, foot-and-mouth disease, rabies, sheep scab, etc.

Infectious diseases of our farm animals, W. H. Dalrymple (*Jour. Comp. Med. and Vet. Arch., 24 (1903), No. 4, pp. 201–212*).—Brief notes on the nature and means of combating tuberculosis, foot-and-mouth disease, Texas fever, and other contagious diseases of domestic animals.

On certain septicemias and some other infections of young animals, A. E. Mettam (*Jour. Comp. Path. and Ther., 16 (1903), No. 3, pp. 229–244*).—Brief notes are given on some of the more common forms of septic infections and intoxications. Particular attention is given to a discussion of white scour in calves and the connection of this trouble with lung disease in calves. The 2 diseases are believed to be of the same origin. For the prevention of these diseases the author recommends careful antisepsis of the umbilicus.

Researches on tetanus, H. Meyer and F. Ransom (*Proc. Roy. Soc. [London], 72 (1903), No. 477, pp. 26–30*).—The authors believe that they have demonstrated that the transportation of the toxin to the central nervous system takes place only by way of the motor nerves. Experiments were carried out, during which it was shown that the progress of the toxin along the motor nerves could be checked by an application of antitoxin to the nerve cords. That the course of the toxin is centripetal along the motor nerve was shown by experiments to determine the period of incubation of tetanus from infection by different methods. The characteristic tetanic rigidity of the muscles is believed to be due to the action of the toxin on the nervous centers. It was found that the tetanus toxin does not reach the spinal centers by way of the sensory nerves nor in the lymphatics of the motor nerves, but in the protoplasm of these nerves.

The relation of various tissues of the animal organism to tetanus toxin, A. Ignatowsky (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1903), Nos. 1, pp. 4–14; 2, pp. 158–168*).—The author briefly reviews the literature relating to this problem. The chief purpose of the experiments reported in this paper was to determine whether all of the organs of the body are capable of fixing tetanus toxin. The organs studied included the brain, spleen, spinal cord, musculature, liver, kidneys, and pancreas, as well as the blood. During the author's investigations it was not found that any special substance was produced in different organs which might account for a reaction toward tetanus toxin. The brain, spinal cord, liver, kidney, spleen, lung, and muscle tissue of rabbits and guinea pigs dead of tetanus, when inoculated into mice were found to be capable of transmitting tetanus without regard to their blood content. The symptoms of the form of tetanus thus produced were quite different from those observed in typical cases, however. It was found that the bile and urine of animals affected with tetanus does not contain any tetanus toxin under normal conditions. The various organs of the body were found to be capable of fixing or neutralizing the tetanus toxin to some extent.

The absorption of tetanus toxin in mammals, A. Marie (*Bul. Inst. Pasteur, 1 (1903), No. 17, pp. 633–640*).—A general discussion of the course taken by the tetanus virus in passing from the periphery to the central nervous structures. It has been shown that the tetanus toxin is absorbed by the terminal portions of the motor nerves, and that a small quantity of toxin placed in contact with these nerves is sufficient to produce tetanus, even in animals which have received a sufficient quantity of antitoxin to render them immune to inoculations with toxin by the hypodermic or intravenous methods. Tetanus toxin is always found in the nerves in inoculated animals. Arguments are presented to prove that the toxin does not penetrate from the periphery to the central nervous system in the lympathic spaces around the nerves, but rather in the nerve substance itself. It is believed that the larger part of the period of incubation is occupied by the transportation of the poison from the periphery to the nervous center in the axis cylinder of the nerves.

Experiments concerning tuberculosis, I, M. DORSET (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 52, pp. 30, pls. 5*).—The present part of this bulletin is concerned with a discussion of the virulence of human and bovine tubercle bacilli for guinea pigs and rabbits. Tubercle bacilli were obtained from cattle as well as from children and adult human beings, and this material was used in the inoculation of guinea pigs and rabbits for the purpose of testing its virulence. In the isolation and propagation of all cultures a medium was used consisting of mixed white and yolk of hens' eggs, and pure cultures were obtained from guinea pigs inoculated subcutaneously with bits of tissue from the various cases of tuberculosis. It was found during the author's numerous experiments that the gross characters of cultures on the egg medium permitted the separation of the cultures into 2 groups, the first of which consisted of 2 bovine and 2 human cultures, while the second included only human tubercle bacilli. The microscopic characters of various cultures on egg media were not such as to allow the differentiation between human and bovine bacilli. Likewise no differentiation could be made in cultures on dog serum. The guinea pigs used in these experiments were healthy and of an average weight of 532 gm. Detailed notes are given on the behavior of various inoculated guinea pigs and the periods during which they lived after inoculation. It was found during these experiments that certain tubercle bacilli of human origin can not be distinguished from the standpoint of their culture, morphology, or virulence for rabbits and guinea pigs from tubercle bacilli of bovine origin. Considerable variation in the virulence of human tubercle bacilli for rabbits and guinea pigs was observed. The general conclusions which are stated as being based on this and other parts of the bulletin still to be published may be stated as follows: From cases of human tuberculosis bacilli may be obtained which will produce the disease in pigs, cattle, and monkeys when inoculated subcutaneously. The genetic relation of tubercle bacilli of various origins appears to be well established. As a rule, bovine bacilli are more virulent than human bacilli for all animals upon which experiments have been made.

Reports on bovine tuberculosis and public health, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 53, pp. 63*).—This bulletin contains 3 reports made before the American Public Health Association in 1901, 1902, and 1903, respectively. The reports have all been noted (E. S. R., 13, p. 786; 15, pp. 313, 512).

Homogeneous cultures of the human tubercle bacillus in peptonized water and the serum reaction obtained with such cultures, E. HAWTHORN (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 22, pp. 816, 817*).—The author describes the behavior of the human tubercle bacillus when grown in peptonized water, and notes briefly certain agglutination experiments made with organisms thus treated. In the agglutination experiments the method of Arloing was closely followed. The results indicate that considerable dependence may be placed upon the agglutination method in diagnosing tuberculosis. The serum reaction was positive only in the case of animals which were affected with tuberculosis.

Experiments on tuberculosis, G. DEAN and C. TODD (*Jour. Path. and Bact., 8 (1903), No. 4, pp. 458–489*).—The object of the experiments recorded in this paper was to determine whether the human tubercle bacillus undergoes any change in virulence for cattle by a preliminary passage through other animals. The experimental animals employed were pigs, cats, rabbits, rats, and mice. A considerable number of each species was used and the material employed for the inoculation of calves was taken from the experimental animals which first succumbed to infection. The calves were killed and carefully examined after a period of 4 months. The experiments which are described in detail indicate that the human tubercle bacillus is not greatly increased in virulence for calves by a single passage through the pig, cat, rabbit, or rat. The human tubercle bacillus, however, proved to be virulent for calves and capable of producing extensive granular tuberculosis in these animals.

The experiments showed, furthermore, the great importance of other bacterial organisms associated with the tubercle bacillus during the process of infection. The author fed human tuberculous sputum to 3 pigs, each pig receiving about 15 cc. at a time. All these animals became infected with generalized tuberculosis and died. The results thus obtained are compared with the work of Koch and his pupils.

Recent work on the question of the identity of human and bovine tuberculosis, A. von Székely (*Centbl. Bakt. u. Par., 1. Abt., Ref., 34 (1903), No. 6–7, pp. 161–181*).—The author reviews in a critical manner the recent literature dealing with the determination of the relationship between human and bovine tuberculosis in connection with a bibliography of this subject. As a result of this review it is concluded that the problem is not definitely solved, but that the possibility of intertransmission of tuberculosis between man and animals must be admitted.

Protective vaccination against tuberculosis, C. O. Jensen (*Maanedsskr. Dyrlæger, 15 (1903), No. 1, pp. 17–23*).—The work of Koch, Maragliano, von Behring, and others is critically reviewed and the hope is expressed that a thoroughly practical method of protective vaccination will soon be developed.

Cultivation of tubercle bacilli in bacterial mixtures and disinfection by formaldehyde, C. Spengler (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 1, pp. 90–114*).—During the experiments reported in this paper a large number of cultures of tubercle bacilli, chiefly from the sputum of tuberculous patients, were made on the various nutrient media, and the effect of formaldehyde fumes upon such cultures was tested. It was found that in mixed cultures other organisms were destroyed by the formaldehyde gas, while the tubercle bacilli remained apparently unaffected or even developed more vigorously.

The method of applying disinfection with formaldehyde gas was that recommended by Flügge. The author concludes that this method may be used to assist in the identification of the tubercle bacillus, but is not reliable as a disinfecting method. In a reply to this paper by C. Flügge the latter argues that the formaldehyde gas was not applied in sufficient concentration and that the tubercle bacilli were inclosed in too large masses of material to allow the development of the full effects of the treatment.

The lesions produced in the kidneys by chloroform extract of tubercle bacilli, L. Bernard and M. Salomon (*Compt. Rend. Soc. Biol. Paris, 55 (1903), Nos. 30, pp. 1233–1235; 31, pp. 1306–1308*).—A chloroform extract of tubercle bacilli was injected into the substance of the kidneys of rabbits and guinea pigs and the progress of the intoxication was studied. Three days after injection the kidney capsule became hemorrhagic and masses of fibrin were observed holding red blood corpuscles. The center of the intoxication is invaded by leucocytes and a considerable extravasation develops. With small doses of tubercle toxin this produces merely an interstitial nephritis, while with large doses a leucocytic infiltration is caused, with or without necrosis of the parenchyma of the kidneys.

The acclimation of rabbits to fatal doses of dead tubercle bacilli, Dembinski (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 33, pp 1409–1411*).—The experiments which were carried on by the author indicate that it is possible by means of gradually increasing intravenous doses of dead tubercle bacilli to bring about a great resisting power in rabbits to the toxins contained in this substance. The resistance of rabbits thus treated, however, is limited. When treated rabbits were inoculated in the brain with quantities two or more times the size of fatal doses, they died as rapidly as the control rabbits.

Rendering judgment on intestinal tuberculosis, K. Müller (*Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 10, p. 317*).—According to the German meat-inspection laws it is necessary to condemn or destroy all organs of which the corresponding lymph glands are tuberculous. Attention is called to the necessity of applying these measures strictly in dealing with intestinal tuberculosis in cattle.

The frequency of tuberculosis of the mesenteric glands in hogs, K. MÜLLER (*Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 8, pp. 242, 243*).—In an examination of 1,328 hogs tuberculosis was found in the intestines or mesenteric glands in 119 cases, in the liver in 19 cases, and in the lungs in 15 cases. In 50 per cent of the cases in which the small intestines were affected, the disease could be recognized without making an incision. According to statistics collected by the author tuberculosis exists in about 9 per cent of all hogs examined.

Pasture and tuberculosis, SCHRÖDER (*Berlin. Tierärztl. Wchnschr., 1903, No. 41, p. 639*).—According to the author's observations the percentage of tuberculosis in hogs falls very decidedly during the late summer months. It is recommended, therefore, that where it is possible animals be turned out to pasture early in the spring.

The treatment of experimental tuberculosis by means of emulsions of tuberculous ganglia, A. RODET (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 27, pp. 1109–1114*).—The purpose of the author's experiments was to determine whether lymphatic ganglia of tuberculous animals contain any curative principles which could be used in the treatment of tuberculosis. The experiments were made with laboratory animals, chiefly guinea pigs, and the results obtained were for the most part negative. It was found that the treatment of inoculated animals with an extract from the lymphatic ganglia alone or associated with goat serum had little effect in checking the development of tuberculosis.

Tuberculins, BÉRANECK (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 21, pp. 889–891*).—Attention is called to the fact that there are several kinds of tubercle toxins, some of which are diffusible and affect the nervous system, while others remain in conjunction with the bacterial bodies and exercise their action by contact with the surrounding tissues. In studying the course of tuberculosis in guinea pigs it was ascertained that the toxins cause a slow wasting process in the organism, while the tubercle bacilli exercise a positive chemotactic influence upon the phagocytes. The phagocytes surround the bacilli but are unable to digest them. In order, therefore, to check the process of tuberculosis it is necessary to neutralize the toxins by means of antitoxins, or to increase the bacteriolytic power of the phagocytes.

The author made a number of experiments for the purpose of testing a method of vaccination. Objection is made to certain methods of obtaining tuberculin on the ground that these methods do not permit a differentiation of the toxins contained in the nutrient medium and those which are fixed in the bacterial bodies. It was observed during the author's experiments that certain cultures were acid while others were alkaline, and an attempt was made to increase the production of acidity. It was found that by artificially rendering cultures decidedly alkaline a tendency was developed toward a production of acid, which was conspicuously shown when the acidity was determined by titration 2 months afterwards. As a result of his experiments the author distinguishes between basitoxins and acidotoxins. For therapeutic purposes the author used a mixture of these 2 toxins in experiments on guinea pigs and man. No undoubted case of cure or immunity against tuberculosis has thus far been produced, but the resistance to the disease has been somewhat increased.

The normal temperature of cattle, J. HAJNAL (*Berlin. Tierärztl. Wchnschr., 1903, Nos. 39, pp. 601–605; 40, pp. 617–619*).—The author made an elaborate study of the normal temperature of cattle with special reference to the bearing of this question upon the results obtained from tuberculin injections. Tables are presented showing the relation of age to normal temperature and also showing the temperatures obtained after tuberculin injections and during the progress of various infectious and other diseases. The author concludes that the normal temperature for the first few days of life is about 40° C., while at ½ year of age it varies from 39 to 40°, at 9 months, between 38.8 and 39.5°, and in cattle over 1 year of age the normal temperature varies between 38 and 39° C.

Biology of the anthrax bacillus and its demonstration in the carcasses of the larger domesticated animals, J. BONGERT (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), Nos. 6, pp. 497–507; 7, pp. 623–630; 8, pp. 772–792, pls. 3; 35 (1903), Nos. 1, pp. 14–24; 2, pp. 108–201*).—In the long series of experiments reported in this article the author attempted to determine how long the anthrax bacillus could be demonstrated successfully in the carcasses of animals dead of this disease, and also to determine the most convenient and most reliable methods for identifying the organism. The literature of the subject is discussed in connection with a bibliography. The experiments carried on by the author included the direct identification of the anthrax bacillus by microscopic means, its demonstration by inoculation and by blood cultures. A study was made of the most suitable methods for preserving anthrax material and for determining the conditions under which spore formation takes place. The results of the examination of anthrax carcasses and streak blood cultures and inoculation experiments made from such material are presented in a tabular form. As a result of his studies the author concludes that the morphological demonstration of anthrax by means of streak cultures is not a thoroughly reliable method. The diagnosis of anthrax by inoculation of experimental animals sometimes fails on account of the interference of other micro-organisms. Blood cultures are considered as furnishing the best means for determining anthrax bacillus. This organism remains in a living condition for from 36 to 50 days, but only 8 to 20 days in decomposing dried blood or the fluids of different tissues. If animal material containing anthrax bacilli is kept upon impervious substrata, the bacilli are destroyed under the action of putrefying bacteria without forming spores. It was found that the anthrax bacillus can multiply and form spores in a very dilute solution of blood in distilled water.

Morphology and chemo-biology of the anthrax bacillus and the bacillus of malignant edema, R. GRASSBERGER and A. SCHATTENFROH (*Arch. Hyg., 48 (1903), No. 1, pp. 1–105, pls. 11*).—The work reported in this study included a comparison of the morphological and biological characters of the bacilli of blackleg and malignant edema. It was found that these organisms are not always easily differentiated. There are intermediate forms which are pathogenic for mice and rabbits, like the bacillus of malignant edema, while at the same time they show characters which belong to the bacillus of blackleg. Two distinct forms of blackleg bacillus were isolated, one motile without flagella and without spores, and the other with spores and flagella.

Cases of anthrax without marked elevation of temperature, G. H. GIBBINGS (*Jour. Comp. Path. and Ther., 16 (1903), No. 2, pp. 169, 170*).—Notes are given on 2 cases of anthrax in which the temperature rose only to 102 and 103° F., respectively. One case ran a fatal course and in the other recovery took place after about a week. These cases are described for the purpose of calling attention to the necessity of precaution in diagnosing anthrax.

A peculiar staining reaction of the blood of animals dead of anthrax, J. M'FADYEAN (*Jour. Comp. Path. and Ther., 16 (1903), No. 1, pp. 35–40, pl. 1*).—In examining the blood from animals dead of anthrax under a magnification of 800 to 1,000 diameters it is observed that the nuclei of the leucocytes exhibit a greenish-blue tint, while the anthrax rods are blue. The segmented character of the rods is quite apparent.

The characteristic feature of the staining reaction is found in the color of the amorphous material around the bacilli. This material exists in the form of granules of a violet or reddish-purple color. The material which thus stains violet with an aqueous solution of methylene blue is believed to be derived from the bacterial envelop. According to the author's experience this reaction is always obtained from anthrax blood, but it is not recommended that the reaction be depended upon exclusively in the diagnosis of anthrax.

Serum therapy for anthrax, A. Jürgelunas (*Ztschr. Hyg. u. Infectionskrank.*, 44 (1903), No. 2, pp. 273–280).—For the production of an immunizing serum a goat and a sheep were inoculated subcutaneously with the first anthrax vaccine and 2 weeks later with the second vaccine. The serum thus obtained was tested in experiments on guinea pigs.

The author concludes from his experiments that the serum of animals which have been rendered unsusceptible to anthrax possesses preventive properties toward this disease. The same serum was used in a series of experiments in the cure of anthrax in guinea pigs. It was found in these experiments that when guinea pigs were inoculated simultaneously with the serum and anthrax cultures, or with the cultures first, followed by the serum after 2 to 4 hours, a portion of the animals lived, while the remainder became infected and died.

The control of anthrax according to the method of Sobernheim, Burow (*Berlin. Tierärztl. Wchnschr.*, 1903, No. 35, pp. 541–545).—In 1897 Sobernheim announced that he had succeeded in immunizing sheep against experimental anthrax. This method was used by the author in vaccinating 8,000 animals, of which only 8 died from anthrax. In the author's opinion further attention must be given to determining the proper degree of attenuation for the vaccine material. The author believes that cattle are more susceptible to anthrax than other domesticated animals. The method of Sobernheim consists in the use of an anthrax serum, followed by an attenuated culture, the doses of the serum being 10 cc. for all animals, and that of the culture being from 0.3 to 0.5 cc. for calves, and 0.5 to 1 cc. for adult cattle.

The natural immunity of fowls to anthrax, O. Bail and A. Pettersson (*Centbl. Bakt. u. Par.*, 1. Abt., *Orig.*, 34 (1903), Nos. 1, pp. 102–108; 2, pp 247–259).—As a final result of the investigations of these authors for the purpose of determining the resisting power of chickens to anthrax, it is concluded that the anthrax bacilli in chickens are destroyed by means of a complement which takes its origin from the bone marrow. This substance, however, is given off quite slowly, so that a portion of the bacilli injected into fowls remains alive for considerable time. The active complement in these processes is not a new product sustaining a relation to the anthrax bacillus alone, but is associated with the corresponding immune body of fowls.

The behavior of anthrax and fowl cholera bacilli in mice during mixed infection, H. M. Gram (*Ztschr. Hyg. u. Infectionskrank.*, 42 (1903), No. 2, pp. 255–266).—The literature of this subject is critically reviewed in connection with a brief bibliography. The author made a number of experiments, during which mice were inoculated simultaneously with anthrax bacilli and fowl cholera bacilli. It was found during these experiments that the association of these bacilli in cultures or in the bodies of mice had no effect upon either pathogenic organism in the way of attenuating or otherwise modifying its action. All the mice which were inoculated with both kinds of organisms died at the same time with the control mice, which were inoculated with one organism. Likewise the association of these 2 organisms had no tendency to increase the virulence of either anthrax bacillus or the fowl cholera bacillus.

Foot-and-mouth disease in Massachusetts, A. Peters (*Jour. Comp. Med. and Vet. Arch.*, 24 (1903), Nos. 3, pp. 133–143; 4, pp. 222–233).—An outline is given of the symptoms and pathological anatomy of this disease, with notes on outbreaks which have occurred in Europe and a detailed description of the recent outbreak in New England. The measures which were adopted by the Cattle Bureau of Massachusetts and the Bureau of Animal Industry of this Department in controlling the disease are described, and notes are given on the effectiveness of quarantine measures and the various methods of eradication which were adopted.

Analogous foot-and-mouth disease, C. C. Mills (*Jour. Comp. Med. and Vet. Arch.*, 24 (1903), No. 5, pp. 292–296).—The author observed 3 or 4 outbreaks of this

disease during the past 10 years. Each outbreak extended over a considerable area and affected a number of animals. The temperature of affected cattle ranged from 103 to 105½° F. Vesicles were formed in the mouth and the animals became stiff as the result of lameness in the joints and sore feet. Nearly all cases observed by the author were among animals which fed almost exclusively upon blue-grass pastures. Recovery usually took place after a change of feed. The symptoms are remarkably similar to those of true contagious foot-and-mouth disease.

The treatment of foot-and-mouth disease by the method of Baccelli, E. Humbert (*Clin. Vet., 26 (1903), No. 28, pp. 168–170*).—The use of corrosive sublimate in the treatment of foot-and-mouth disease was tested by the author and the method employed by Baccelli was critically examined. It is believed that the method is really valuable in checking the course of the disease.

Experiments in the treatment of foot-and-mouth disease by the method of Baccelli, N. L. Buonsanti (*Clin. Vet., 26 (1903), No. 35, Sup., pp. 93*).—An elaborate study was made of the use of corrosive sublimate in the treatment of this disease and the author's final report is contained in the present article. Notes are given on the prevalence of foot-and-mouth disease, the symptoms and anatomical lesions which appear during the progress of the disease, together with a record of experiments undertaken for the purpose of showing the tolerance of cattle toward intravenous injections of corrosive sublimate and the effect of this treatment upon the course of foot-and-mouth disease. In the author's experiments it was found that cattle endured without bad effects therapeutic doses of corrosive sublimate at the rate of 0.04 to 0.05 gm. per 100 kg. live weight. In the author's opinion the efficacy of this treatment in cases of foot-and-mouth disease was demonstrated. The temperature was lowered, the course of the disease was shortened, and the development of dangerous complications was prevented in a large percentage of cases. The method is recommended as safe when applied under antiseptic precautions and as worthy of a more general application.

Texas cattle fever (*Jour. Jamaica Agr. Soc., 7 (1903), No. 12, pp. 485–490*).—The course, symptoms, and pathological lesions of this disease are described in some detail and notes are presented on the method of immunization by means of the blood of recovered animals.

The treatment of malaria in cattle, Jackschath (*Berlin. Tierärztl. Wchnschr., 1903, No. 34, pp. 530–532*).—Malaria in cattle appears to be associated with certain soil and climatic conditions which resemble the conditions of malarial districts for man. Animals which come to such regions from localities where the disease does not prevail regularly become affected. Detailed notes are given on the symptoms and course of the disease. The author recommends blood letting in the early stages, followed by injections of spirits of camphor and the administration of doses of iron sulphate in sweet milk. After pronounced symptoms of constipation have appeared, however, the author believes that prognosis is unfavorable in the majority of cases. As a preventive treatment it is recommended that in the spring cattle be given sugar of lead in doses of 0.5 gm. for a period of 8 days.

Milk fever: A new treatment, E. H. Lehnert (*Jour. Comp. Med. and Vet. Arch., 24 (1903), No. 5, pp. 307–310, fig. 1*).—The oxygen treatment was used by the author with good results. In 1 case the animal recovered completely within a period of 4 days, and decided improvement was manifested within a few hours.

Traumatic galactophoritis and mammitis with pyemic metastasis in domestic animals, Jovis (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), June, pp. 334–343; July, pp. 395–406, figs. 6*).—Detailed descriptions are given of the symptoms and pathological anatomy of various forms of mammitis affecting different parts of the udder and due to different causes. Clinical notes are given on 27 cases, nearly all of which were in cows. Particular attention is given to tuberculous mammitis and the symptoms by which it may be identified.

Epizootic abortion in cows and its prevention, J. PENBERTHY (*Jour. Comp. Path. and Ther., 16 (1903), No. 1, pp. 13–19*).—Attention is called to the etiology of the various forms of abortion observed in cattle, with especial reference to the epizootic form. In combating this disease the author considers it necessary to exercise a close supervision upon the formation of a herd, in order not to introduce any infected animals. Treatment of aborting cows is somewhat unsatisfactory.

Contagious abortion in cows, J. M. FONTAN (*Jour. Agricole [Paris], 14, (1903), No. 165, pp. 213–215*).—The symptoms and pathological anatomy of this disease are briefly described. In the prophylaxis of contagious abortion the author recommends the exercise of special care in introducing new animals into the herd and the thorough application of an antiseptic, such as corrosive sublimate, after the appearance of abortion.

Mammary actinomycosis in cows, J. KOWALEWSKY (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), Sept., pp. 513–529*).—Mammary actinomycosis occurs most frequently in pigs and rarely in cattle. A table is presented showing the relative frequency with which various organs of cattle are affected by actinomycosis. The author had occasion to examine 3 cases of mammary actinomycosis in cattle and detailed notes are given on the pathological anatomy. Notes are given to assist in differential diagnosis between actinomycosis and various forms of mammitis. In diagnosing this disease the author believes the best results are obtained from a microscopic study of the milk.

Actinomycosis, V. E. MERTENS (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 1, pp. 45–89, pls. 2*).—A study was made of the behavior of actinomyces on various culture media, and results thus obtained are compared with the published results of other investigators of this subject. During the author's investigations special attention was given to determining the cause of the formation of club-shaped structures in the mycelia of actinomyces. It is concluded from these investigations that the club-shaped structures are produced by the living mycelia as the result of degenerative processes which may affect whole hyphæ or only certain parts of them. A number of inoculation experiments were made in rabbits and notes are given on the course of the disease and the forms of actinomyces obtained from such cases.

Actinomycosis in dogs, L. BAHR (*Maanedsskr. Dyrlæger, 15 (1903), No. 6, pp. 172–196, figs. 4*).—Detailed notes are given on the pathological anatomy of this disease in a number of cases in dogs. The source of infection is discussed and the peculiarities of the disease as related to the organism of dogs are mentioned. Actinomycosis may appear in dogs in the form of tumors, ulcers, or chronic fistulous processes, and frequently leads to pleuritis or peritonitis. Apparently there are several species of actinomyces concerned in the production of the disease in dogs.

Six cases of carcinoma of the ox, A. M. TROTTER (*Jour. Comp. Path. and Ther., 16 (1903), No. 3, pp. 244–252, pl. 1, figs. 2*).—Detailed clinical and post-mortem notes are given on cases of carcinoma of the orbit, rumen, and lung in cattle. The forms of carcinoma described in this paper are epitheliomatous, and the form characterized by spheroidal cells.

Hypoderma bovis, T. P. KOCH (*Maanedsskr. Dyrlæger, 15 (1903), No. 5, pp. 129–159*).—The life history of this insect is described in great detail in connection with a critical review of the literature relating to the subject.

Pathological changes in the esophagus due to the larvæ of warble flies, C. O. JENSEN (*Maanedsskr. Dyrlæger, 15 (1903), No. 6, pp. 169–171*).—Certain pathological conditions are noted in the esophagus of cattle infested with warble flies. The author investigated the cause of these conditions with the result that the warble fly larvæ were found to be apparently responsible for the production of infiltration processes in the esophagus.

Serum therapy in sheep pox, A. BORREL (*Ann. Inst. Pasteur, 17 (1903), No. 11, pp. 732–762*).—A detailed description is presented of the course of sheep pox, the

method of vaccination against the disease, and the collection and preservation of the vaccine. Experiments were carried on for the purpose of testing the value of serum therapy in the treatment of the disease. The method was applied to 10,000 animals with excellent results. No death resulted in the vaccinated animals from infection with sheep pox, while only 2 per cent of the vaccinated sheep died of septicemia or other complications.

Verminous broncho-pneumonia of sheep, G. SAINT-HILAIRE (*Bul. Dir. Agr. et Com.* [*Tunis*], *8* (*1903*), *No. 29, pp. 510–516*).—Two species of roundworms are concerned in producing this disease in sheep, viz, *Strongylus filaria* and *S. rufescens*. These species are described and notes are given on the symptoms and pathological anatomy of the disease. In treating infested animals the use of creosote, essence of turpentine, or picrate of potash is recommended, combined with fumigation with some irritating gas. As an intratracheal injection the author recommends a mixture containing 1 part iodin and 5 parts iodid of potash to 50 parts of water, the whole to be mixed with equal parts of essence of turpentine.

Notes on parasites of sheep, J. H. STEWART and H. ATWOOD (*West Virginia Sta. Bul. 90, pp. 223–230, pls. 3*).—A description is given of *Strongylus contortus*, the common stomach worm of sheep, and notes are given on the life history of this parasite, the disease symptoms which it causes in infested sheep, and the means of combating the pest. A description of the benzine and coal-tar creosote treatments for this worm is quoted from this Department. The authors recommend the use of coal-tar creosote. Brief notes are also given on nodular disease of the intestines in lambs. This disease broke out in a flock of 60 lambs purchased by the Station, and in the prevention of the disease it is recommended that low wet lands be drained or pastured by cattle.

Vaccination of hogs, PLATSCHEK (*Berlin. Tierärztl. Wchnschr., 1903, No. 34, p. 533*).—This article is written in reply to a criticism made by Joseph that the use of a cord drawn through the mouth of hogs in vaccination would lead to the further spread of the disease, since infectious material would naturally be found in the mouth of diseased hogs. The author replies that all apparatus used in treating hogs is necessarily disinfected between each operation.

Immunization from hog cholera, (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 43, pp. 3*).—During immunization experiments attenuated and virulent liquid or dried blood, with or without the admixture of blood of immune animals, has been used. Animals thus treated have been tested by inoculation with virulent blood or by exposure to diseased animals. It has been found that immunity toward hog cholera does not necessarily imply immunity to swine plague, and this suggests the desirability of proving the character of the disease in all cases by careful autopsies.

Vaccination for swine erysipelas in Wurttemberg in 1902 (*Berlin. Tierärztl. Wchnschr., 1903, No. 31, pp. 481, 482*).—Out of 27,811 hogs which were vaccinated for this disease, all except 5 were vaccinated with small doses for protective purposes, while the other 5 were treated with curative doses. No loss due to vaccination occurred. The total quantity of serum used was 147,218 liters obtained from official sources and 6,460 liters from private sources.

Necrotic inflammation of the mouth in small pigs, L. J. LAURITSEN (*Maanedsskr. Dyrlæger, 15* (*1903*), *No. 4, pp. 121, 122*).—A number of cases of this disease in young pigs were observed by the author and the etiology appeared to be somewhat uncertain. The cases readily yielded to the author's treatment, which consisted in scraping the necrotic areas and applying antiseptic and astringent washes.

Trichinæ and trichina inspection in Denmark, ST. FRIIS (*Maanedsskr. Dyrlæger, 15* (*1903*), *No. 4, pp. 97–115*).—Notes are given on the system of inspection for trichina in Denmark, together with statistical data regarding the frequency of occurrence of this worm. A discussion followed the presentation of the paper, during which the desirability of compulsory inspection for trichina was urged.

The occurrence of trichina in the badger, Lübke (*Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 4, pp. 116, 117, fig. 1*).—Trichina has frequently been found in badgers, and since these animals are used as human food in certain mountainous regions, a number of cases of trichinosis have developed as a result. The author calls attention to the fact that badgers frequently catch and eat mice and rats, and the infestation of the badgers with trichinæ is thus explained.

The significance of rabies lesions in the nervous system, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 31, pp. 1284–1286*).—Notes are given on the lesions which develop during the progress of rabies in various parts of the nervous system. In general the lesions caused by rabies virus in the nervous system are almost identical in detail and as a whole with those of sheep pox.

The histological diagnosis of rabies in the dog, A. Rabieaux (*Ann. Soc. Agr. Sci. et Ind. Lyon, 7. ser., 10 (1902), pp. 61–72, figs. 3*).—The author describes the various lesions in the nervous system which have been mentioned by various authors as of importance in the diagnosis of rabies. Attention is called to the great importance of making an accurate and certain diagnosis of this disease, and it is urged that absolute dependence can not be placed on the lesions in the nervous system caused by the development of rabies. These lesions, however, are believed by the author to be almost always diagnostic and to assist greatly in rendering a certain diagnosis.

The isolation of rabies virus by filtration, P. Remlinger (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 33, pp. 1433, 1444*).—In order to obtain rabies virus free from contamination with micro-organisms of known size the author believes that the best results are to be obtained by repeated passage through filters small enough to exclude all other organisms.

The micro-organism of rabies discovered by Negri, M. Beck (*Fortschr. Vet. Hyg., 1 (1903), No. 9, pp. 253, 254*).—According to the author's experience the protozoan organism claimed by Negri to be the cause of rabies must be recognized as such. It is stated that the organism was found in 47 out of 72 cases of rabies.

The toxin of the organism of dog distemper, C. Phisalix and J. Lignières (*Compt. Rend. Soc. Biol. Paris, 55 (1903), Nos. 24, pp. 915–924; 25, pp. 980–982; 26, pp. 1021–1023; 27, pp. 1085–1089*).—This is a series of controversial articles relating to the general subject of the etiology and treatment of distemper of dogs. According to Phisalix if dogs are inoculated intravenously with very virulent cultures of *Pasteurella caviæ* or *P. canis* the first symptoms of inoculation are rapidly observed. *P. canis* is said to produce in artificial cultures a soluble toxin which acts on the nervous system and produces digestive disturbances.

In some of the experiments of Lignières the vaccine recommended by Physalix was found to have little or no effect in increasing the resistance of dogs to distemper, while a polyvalent vaccine obtained by Lignières appeared to prevent the fatal development of the disease in many instances. Phisalix claims that according to ordinary methods of treatment from 25 to 80 per cent of affected dogs die of the disease. In his experiments, however, only 18 out of 985 vaccinated dogs died of distemper. Detailed statistics are presented on this point and the conclusion is drawn by Phisalix that success was had in the use of his vaccination method in about 98 per cent of cases.

There is not a strict agreement between the 2 authors regarding the nature of the organism which is the cause of dog distemper, but it is believed to be a Pasteurella. Phisalix admits a lack of success in some experiments, but maintains that under ordinary conditions the use of his vaccine method is attended with excellent results. On the other hand Lignières maintains that, should the vaccine be as effective as claimed by Phisalix, it is necessary that it contain an antitoxin. Such, however, can not be the case from the nature of its preparation. Lignières admits that the vaccination method of Phisalix has an evident value, but is less certain in its results than claimed by Phisalix.

Acarian eczema in dogs, L. Scheben (*Berlin. Tierärztl. Wchnschr., 1903, No. 31, pp. 482, 483*).—In the treatment of this disease the author had good results from the use of a $4\frac{1}{2}$ per cent solution of nitrate of silver, which was used as a wash upon affected parts.

Necrosis and the necrosis bacillus, W. Ernst (*Monatsh. Prakt. Tier., 14 (1903), No. 5, pp. 193–228, figs. 14*).—The necrosis bacillus (*Streptothrix necrophora*) is described as being of almost ubiquitous occurrence and as producing a great variety of pathological lesions, according to the part or organ affected. Numerous experiments were made by the author in cultivating this organism, studying its morphology, and in inoculating small animals. It was found that the necrosis bacillus grows luxuriantly in nutrient media which remain moderately soft at the ordinary temperature of the laboratory incubator, and that the organism grows well also in milk and Martin bouillon. Growth takes place between temperatures 36 and 40° C., but most rapidly at 39° C. There are no flagella on the necrosis bacillus and no movement is to be observed. The organism is very pathogenic for mice and rabbits and less so for birds, rats, guinea pigs, and cats. In hogs, sheep, and cattle only local processes are developed as a rule. Feeding experiments with hogs and sheep failed to produce infection.

Angiomatosis capillaris maculosa in the liver of ruminants, Stroh (*Monatsh. Prakt. Tier., 14 (1903), No. 3–4, pp. 133–187, figs. 2*).—The pathological lesions produced by this disease are described by the author in great detail. As a result of numerous observations and experiments it is concluded that this disease is peculiar to the liver of ruminants. The pathological foci in the liver arises as a rule in consequence of the compression of the abdominal portion of the posterior vena cava. The disease occurs in the liver of cattle of all ages and also in sheep. As a rule the pathological process seems to have only a limited existence and gradually becomes checked.

The sequelæ of contagious coryza, J. J. Kofler (*Monatsh. Prakt. Tier., 14 (1903), No. 2, pp. 71–83*).—According to the author's experience contagious coryza may be complicated with a number of diseases, such as staggers, embolic pneumonia, iritis, petechial fever, etc.

The giant Trypanosoma discovered in the blood of bovines, A. Lingard (*Centbl. Bakt. u. Par., 1. Abt., Orig., 34 (1903), No. 2, pp. 234–238, pl. 1*).—Notes are given on the giant Trypanosoma discovered in the blood of cattle during an investigation of surra.

Trypanosomes, with special reference to surra, W. G. Bowers (*Jour. Comp. Med. and Vet. Arch., 24 (1903), No. 2, pp. 65–71*).—The author mentions the characteristic features of various species of pathogenic Trypanosoma and describes in considerable detail the organism of surra. This disease is believed to be transmitted in the Philippines through the agency of *Stomoxys calcitrans*. In the treatment of surra some success has been had with the administration of arsenic by intravenous method.

The reproduction and development of trypanosomata in the blood of animals affected with surra, A. Brauer (*Berlin. Tierärztl. Wchnschr., 1903, No. 40, pp. 613–616, figs. 7*).—According to the author's investigations trypanosomata of surra form spores in blood in which the parasites are present in large numbers. The author observed a union of the trypanosomata by their blunt ends. At certain stages the blood organisms assume forms and actions which greatly resemble those of bacteria. Division processes are observed in spores associated in large colonies. As soon as the blood parasites reach a diameter of $\frac{1}{3}$ to $\frac{1}{2}$ that of the red blood corpuscle they manifest amœboid movements and attack the red blood corpuscles, causing lesions which are easily demonstrated.

A new Trypanosoma and the disease caused by it, A. Theiler (*Jour. Comp. Path. and Ther., 16 (1903), No. 3, pp. 193–216, pl. 1, fig. 1*).—In studying a disease of cattle in South Africa which was believed to be identical with what has previously

been called biliary fever or gall sickness, the author discovered an organism which has been given the name *Trypanosoma theileri*. This organism can be quickly demonstrated by examining fresh blood of affected animals. Two forms of the parasite are observed, in one of which the centrosome lies at the posterior end, while in the other it is in the nucleus. Notes are given on the methods of reproduction of this organism, on involution forms, and agglutination. The phenomenon of agglutination is rarely observed in the case of *T. theileri*. Inoculation experiments were made on horses, dogs, sheep, goats, rabbits, guinea pigs, rats, and mice. All these experiments gave negative results, and it is therefore concluded that the organism affects only cattle. *T. theileri* was found in species of Hippobosca, which were later identified as *H. rufipes* and *H. maculata*. These flies are believed to be the natural means of transmitting the disease. Detailed notes are given on the symptoms and pathological anatomy of this disease. In the author's experience about 58 per cent of cattle were susceptible. Susceptibility was observed in cattle of all ages; the rate of mortality was 12.5 per cent, period of incubation from 4 to 6 days. Many cattle are naturally immune, and this is attributed to previous infection with the blood parasite.

The existence of a piroplasmosis in horses in Madagascar, THIROUX (*Compt. Rend. Soc. Biol. Paris, 55 (1903), No. 29, pp. 1188, 1189*).—*Piroplasma equi* is briefly described, and notes are given on its distribution with special reference to its occurrence in horses in Madagascar.

The development of the parasite of the tsetse-fly disease in mammals, E. MARTINI (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 2, pp. 341–350, pl. 1, figs. 10*).—The author made a study of the various forms in which this organism occurs in mammals, especially in dogs. The morphology of these forms is described in detail. It was found that the organisms were present in considerable numbers in specimens of *Stomoxys calcitrans* which had been allowed to suck the blood of infected mammals. The Trypanosoma was found in the alimentary tract of these flies for a period of 23 hours. No division stages were observed in the blood parasite, however, and the parasites appeared ultimately to be digested in the alimentary tract of the flies. Experiments instituted for the purpose of testing the possibility of transmission of the disease by such infected flies which were allowed to suck the blood of dogs gave negative results in all cases.

Hemoglobinemia in horses, C. ROCHE (*Jour. Méd. Vét. et Zootech., 5. ser., 7 (1903), July, pp. 414–416*).—In the author's experience this disease is comparatively rare. During the month of June, however, of the past year 25 cases were observed, and notes are given on the symptoms, etiology, and treatment. The author believes that the numerous sudden changes of temperature which occurred were partly responsible for the unusual prevalence of this disease. Nearly all cases responded favorably to hydrotherapy.

Equine malaria and its sequelæ, A. THEILER (*Jour. Comp. Path. and Ther., 16 (1903), No. 2, pp. 97–120*).—Malaria of horses in South Africa is said to be due to infection with *Pyroplasma equi*. Notes are given on the appearance of this organism and on inoculation experiments to determine the causal relation of the organism to the disease. Apparently 1 attack of equine malaria confers a certain amount of immunity, but experimental evidence of this proposition was not obtained by the author. The sequelæ of the disease are frequently of a serious character. The author concludes from his study that while *P. equi* is the primary cause of equine malaria, this organism predisposes to a symbiotic and secondary infection with a specific bacillus. The secondary infection may take place after complete recovery from the primary malaria.

South African horse sickness, E. C. WEBB (*Jour. Comp. Path. and Ther., 16 (1903), No. 2, pp. 120–127*).—The pathological anatomy of this disease is described on the basis of 48 post-mortem examinations. The symptoms and lesions are presented in tabular form according to the peculiar features of the different cases. As a

rule treatment is without result. The use of antiseptics as drenches or by subcutaneous and intratracheal injections has proved somewhat effective in certain cases.

Infectious cerebro-spinal meningitis in horses, H. STREIT (*Berlin. Tierärztl. Wchnschr., 1903, No. 37, pp. 577–584*).—The author discusses the literature of this subject in connection with a brief bibliography. The symptoms of the disease are described in a number of cases which the author observed. A bacteriological examination showed no micro-organisms in the spleen or blood of certain cases, while a few diplococci were found in 1 case. Diplococci were isolated from the fluid in the subarachnoid space. These organisms were cultivated and used in inoculation experiments on rabbits. In these experiments rabbits died within from 36 to 48 hours when inoculated with 1 cc. of the exudate obtained from the subarachnoid space.

Notes are given on the morphology of the micro-organism and on its behavior on various culture media. The organism is pathogenic for rabbits, guinea pigs, and white mice, but not for chickens or doves. It is destroyed by subjection to a temperature of 60° C. for 10 minutes, by treatment for 10 seconds in a 1 per cent solution of corrosive sublimate, or for 3 seconds in a 2½ per cent solution of creolin.

Primary infectious osteomyelitis in horses, FRÖHNER and KÄRNBACH (*Monatsh. Prakt. Tier., 14 (1903), No. 10, pp. 433–444, figs. 6*).—Detailed notes are given on the symptoms and pathological anatomy of this disease in 2 cases. The coffin bone and cannon bone were affected most seriously by the disease. On account of the infectious nature of the disease and the practical impossibility of curing it the author recommends that diseased animals should be killed. In very valuable horses it is believed that the foci of the disease in the affected bones may be removed with success in a considerable percentage of cases.

Glanders, F. K. KLEINE (*Ztschr. Hyg. u. Infectionskrank., 44 (1903), No. 2, pp. 183–195*).—The experiments recorded in this paper were carried out partly for the purpose of testing the correctness of the general belief that glanders bacillus gradually loses its virulence when cultivated for long periods on nutrient media. The cultures which were used by the author had been kept in the laboratory for a period of several years. It was found that these cultures produced infection in guinea pigs when inoculated into the abdominal cavity in very minute doses.

The conclusion is reached that the common belief that glanders bacilli lose their virulence in artificial cultures is based on mixed cultures, and that agglutination tests should be made to distinguish between the glanders bacilli and other associated organisms. Such tests were made by the author with the result that a number of organisms were found in glanders cultures which had nothing to do with the glanders bacillus.

Detailed notes are given on the methods for obtaining specific sera which agglutinate the glanders bacillus. During the author's experiments little success was had in immunizing guinea pigs against the true glanders bacillus. The author ascribes the apparent success of other investigators along this line to the use of mixed cultures.

Glanders among the street-car horses of Cologne, LOTHES (*Fortschr. Vet. Hyg., 1 (1903), Nos. 7, pp. 209–212; 8, pp. 237–240; 9, pp. 257–263*).—On account of the losses suffered from glanders by the street-car companies of Cologne an investigation was undertaken for the purpose of devising practical means of checking the outbreaks of this disease. A number of post-mortem examinations were made and the pathological lesions are described in detail.

Notes are also presented on the various forms which the disease assumes and on the conditions surrounding different outbreaks of glanders. Mallein injections were used on an extended scale with good results. In one instance 105 horses were injected and 14 reacted. Of these, 12 were found to exhibit pathological lesions upon post-mortem examination. The losses suffered from the destruction of glanderous horses were small as compared with the losses necessitated by the continued prevalence of the disease.

Agglutination and serum diagnosis as applied to glanders, A. RABIEAUX (*Ann. Soc. Agr. Sci. et Ind. Lyon, 7. ser., 10 (1902), pp. 45–59*).—A series of experiments was conducted by the author for the purpose of testing the applicability of the agglutination method in the diagnosis of glanders.

The author states as the result of his investigations that this is essentially a laboratory method and consequently can not replace experimental methods customarily employed under other practical conditions. Nevertheless, the method is considered as valuable and as furnishing a means of testing the reliability of other methods in the diagnosis of glanders. If the serum which is to be examined is not pure, the author claims that it is necessary to subject the mixture of serum and the glanders culture to a temperature sufficient to sterilize the serum in order to avoid the multiplication of organisms other than the glanders bacillus.

Therapeutic observations on morbus maculosus, PERL (*Berlin. Tierärztl. Wchnschr., 1903, No. 41, pp. 638, 639*).—Morbus maculosus treated with Collargol was not so readily controlled as when Ichthargan was administered. While Collargol caused a lowering of the temperature its other effects were unsatisfactory. Ichthargan, however, caused a diminution of temperature and return of the normal appetite. Potassium iodid exercised a pronounced effect in the resorption of the swellings which occurred in the progress of this disease.

The serum treatment in purpura hemorrhagica, J. H. MCLEOD (*Jour. Comp. Med. and Vet. Arch., 24 (1903), No. 3, pp. 166, 167*).—Brief notes are given on the treatment of a few cases of this disease in horses. Tonics and stimulants were administered and the animals were also treated with antistreptococcus serum in large doses. Satisfactory results were obtained from this treatment.

Botryomycosis, FRÖHNER (*Monatsh. Prakt. Tier., 14 (1903), No. 10, pp. 468–472*).—Notes are given on the occurrence of this disease in a number of cases. In one the location of the disease was near the base of the tail, while in another case the withers were affected in a manner similar to fistula. The disease was also observed in a few cases in the region of the fetlock.

Generalized botryomycosis, F. TÜRNAU (*Ztschr. Fleisch u. Milchhyg., 13 (1903), No. 10, pp. 317–319*).—The symptoms and lesions of this disease are described. In 1 case the bronchial glands and kidneys were not affected, while the surface of the lungs was covered with yellowish tubercles in large numbers. Similar tubercles were found in the liver tissue. In general the lesions in the lungs and liver closely resemble those in cases of tuberculosis.

Animal parasites, A. A. BROWN (*Jour. Dept. Agr. Victoria, 2 (1903), Nos. 1, pp. 72–74; 2, pp. 174–176*).—Brief notes on the anatomical characters of parasitic roundworms, with special accounts of lungworms in sheep and gapeworms in fowls.

Diseases of fowls, J. BARCLAY (*Imp. Dept. Agr. West Indies, Pamphlet No. 23, 1903, pp. 30–48*).—A brief account of enteric fever, roup, bronchitis, gapes, cramps, and other common diseases of fowls.

Investigation of fowl plague, the new poultry disease, R. OSTERTAG and K. WOLFFHÜGEL (*Monatsh. Prakt. Tier., 14 (1903), No. 2, pp. 49–70, figs. 2*).—The disease investigated by the authors occurred in a number of extensive outbreaks in Brunswick and elsewhere and caused great loss among fowls. Inoculation experiments showed that it is easy to transmit the disease from one hen to another, but pigeons, mice, guinea pigs, and rabbits, and even ducks and swans, were apparently resistant. The symptoms and post-mortem appearances of this disease are described in great detail. No success was had in isolating the pathogenic micro-organism, but it was found that the virus was destroyed by subjection to a temperature of 70° C. As a rule the disease results in death within from 2 to 4 days. Notes are given on the differential diagnosis of these and related poultry diseases.

An epizootic of exudative typhoid in fowls, A. MAGGIORA and G. L. VALENTI (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 2, pp. 185–243*).—Notes are given on

the symptoms of a disease which occurred in a number of flocks of poultry in the Province of Modena. The disease assumed various forms, such as the typhoid form, the nervous form, and the diphtheritic form. The comb and other bare portions of the head assumed a violet or blackish color; inflammatory alterations were manifest in the pleura and peritoneum, and pathological changes were observed in the larynx, pharynx, and various other organs. Several attempts were made to obtain cultures of the pathogenic organism from the blood, bone, marrow, and various organs. Although a variety of culture media was used, the results were always negative, except in cases where material was taken from fowls which had been dead for a few hours. In such cases an organism was obtained from the intestinal contents, peritoneal exudate, and from the pharynx, which appeared to be a coccobacterium, and occurred almost in pure cultures, especially in the duodenum. Inoculation experiments were made with this organism in fowls, rabbits, pigeons, and guinea pigs. An infection was produced in fowls which ran a course identical with that of spontaneous infection. It was found that the organism remained in a virulent condition in the bodies of dead fowls for a period of 45 days. The authors conclude that this disease is a form of hemorrhagic septicemia caused in part by an organism in the alimentary tract belonging to the coli group. It could not be concluded as certain from the experiments of the authors that this organism is the only cause of the disease. The virus is pathogenic for fowls and several species of birds, but is without effect upon ducks, pigeons, rabbits, guinea pigs, or white mice. It is believed that this disease is distinct from that described by Centanni as occurring in the Province of Ferrara.

Notes from practice, A. Fumagalli (*Clin. Vet., 26 (1903), No. 35, pp. 208, 209*).—Brief notes are given on actinomycosis in dogs and on enzootic meningo-encephalitis in chickens. The latter disease affected a flock of 100 fowls which came under the author's observation. The symptoms were dejection, hyperemia, and diarrhea during the later stages. The rate of mortality was very high. The cause of the disease is not understood, but the possibility of its being a form of fowl cholera is suggested.

Concerning Gurmin, Jelkmann (*Berlin. Tierärztl. Wchnschr., 1903, No. 41, pp. 637, 638*).—Gurmin is the name of a serum preparation manufactured for the treatment of contagious coryza and other infectious diseases. The author used this remedy in the treatment of 10 cases of contagious coryza in horses. It was found that Gurmin exercises a specific bactericidal action toward the organisms of this disease. The serum appears also to exercise a slight preventive action when injected into healthy horses. Good results were obtained in 10 cases and the author believes that the drug may be depended upon to exercise curative effects wherever the disease is merely a streptococcal infection and does not involve suppuration of the lymphatic glands.

Further notes on silver therapy, H. Meyer (*Berlin. Tierärztl. Wchnschr., 1903, No. 35, p. 545*).—Notes are given on the use of various silver preparations, such as Protargol, Collargol, and Ichthargan. The author believes that these remedies, especially the latter, are very valuable in the treatment of infectious diseases, where it is desired to attenuate or destroy the pathogenic bacilli in the animal body. Further experiments are required before it will be definitely known how dogs react to intravenous injections of silver preparations and how valuable these preparations may be in the cure of distemper.

The sale of animals affected with contagious diseases, V. Galtier (*Ann. Soc. Agr. Sci. et Ind. Lyon, 7. ser., 10 (1902), pp. 1–44*).—An elaborate discussion is given of the dangers attending the sale and consumption of the meat of diseased animals, together with mention of the measures which are necessary for regulating these problems.

Laws (Federal, State, and Territorial) relating to contagious and infectious diseases of animals (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 54, pp. 46*).—This bulletin is of the nature of a continuation of Bulletin 43 of the Bureau of Animal Industry, and contains copies of Federal, State, and Territorial laws relating to contagious and infectious diseases of animals enacted during the years 1902 and 1903.

TECHNOLOGY.

Report on the results of investigations into cider making, F. J. Lloyd (*London: Bd. Agr. and Fisheries, 1903, pp. 145, figs. 17*).—A report is here given of investigations made by the author under the auspices of the Bath and West and Southern Counties Society of England for the 10 years ended 1902 on problems in cider making in England. Some methods of detecting cider preservatives are given and tables showing the composition of the juice of various apples from different localities and in different years. The composition of apple juice has been found to vary with the season, the locality from which it was obtained, the variety, size of the apple, etc.

The amount of juice in an apple apparently does not depend upon size, as sometimes small apples gave a large and at other times a small proportion of juice. Generally, however, the specific gravity of the juice appears to increase as the size of the apple decreases. Tables of analyses are given, which show that dessert varieties of apples contain, as a rule, far more acid than the cider varieties. It is believed that this accounts for the difficulty experienced in making good cider from table fruit. Practically no difference was found in the analyses of frosted apples and apples of the same variety which had not been frosted. No reason could therefore be assigned why frosted apples are less suitable for cider making, as some believe, than unfrozen apples.

Apples for cider should be gathered by hand or shaken off on a cloth or large net spread under the tree. In one experiment cider made from apples which had been stored on the ground had a strong earthy flavor. Decay sets in rapidly in apples which are bruised. Analyses of the juice of apples which had been kept in a clean place but allowed to rot, showed the following composition: Acid 0.18, sugar 12.19, tannin 0.168, and solids 13.42 per cent. Juice from sound apples of the same varieties contained 0.23 per cent acid, 12.5 per cent sugar, 0.54 per cent tannin, and 13.7 per cent solids. These figures indicated that in rotting two distinct changes take place. The tannin is precipitated in large part and so does not enter the juice, and the acid is slightly diminished. There is also a loss of sugar. The apples used in this experiment were affected with "brown" rot.

The juice from the rotten apples was of a much darker color than that from the sound apples, and cleared much more rapidly when preserved in bottles. These experiments are believed to clearly show that the effects produced by allowing the apples to fall and rot on the ground are detrimental to the manufacture of good cider. This is especially true if the apples are exposed to rain. The author's experiments show that apples for cider should be picked when they have attained maximum size, but before they have commenced to ripen. They should then be stored in a dry, well ventilated room. The best cider is made in cool weather, therefore cider making should be delayed as long in the fall as possible.

It is recommended that apples be washed when they are dirty. The specific gravity of the juice of unwashed apples in one experiment was found to be 1.057, and of washed apples 1.056, thus showing the loss of solid matter in the juice due to washing to be scarcely perceptible. As regards fermentation, this proceeded more regularly and only slightly less rapidly in the juice from the washed apples than in that from the unwashed apples. The flavor of the cider made from the washed apples was considered superior to that of the unwashed fruit.

In a mill called a "scratcher" more juice was obtained than when the apples were run through a crusher, the figures being 720 lbs. of juice in 1,000 lbs. of apples run through the scratcher as compared with 650 lbs. from the same quantity of apples run through a crusher. In the scratcher the fruit was torn to pieces instead of being crushed. When a mill was used which crushed the pips a cider was produced the quality of which was inferior to that obtained when the pips were not crushed. The composition of apple pips dried at 212° F. was found to be as follows: Oil 18.60, albuminoids 33.12, carbohydrates 26.08, woody fiber 18.55, and mineral matter 3.65 per cent. In pressing out the juice from the pomace a clearer juice has been obtained when the pomace was wrapped in cloth than when straw was used, and thin cloth has been found as effective for this purpose as thick Manila cloth. By using cloths as good results are obtained in one pressing as in 2 or 3 pressings when straw is used.

In investigating the question as to whether the pomace should be pressed at once or allowed to stand some time before pressure, the results showed that no greater quantity of juice could be obtained from pomace which had been allowed to stand after grinding than from pomace which was pressed at once. By allowing the pomace to stand 24 hours before being pressed some of the tannin appeared to be precipitated and the juice was not as clear and bright as when the pomace was pressed at once.

Analyses of pressed pomace showed about 72.4 per cent water, 18.34 per cent sugar, 1.08 per cent oil, 1.27 per cent nitrogenous matter, 4.64 per cent woody fiber, and 2.27 per cent mineral matter. After the juice has been obtained it has been found desirable to keep it from the air as much as possible. For this purpose it is put into funnel-shaped vats, called keeves. When covered over so that drafts of air can not penetrate, a layer of carbonic-acid gas soon accumulates over the liquid and protects it from the air. The opinion that when the juice ferments a portion of the solid matter which is in suspension passes into solution has been found by the author to be erroneous. Fermentation does not take place to any extent until the temperature of the juice reaches 50 to 52° F. After fermentation begins it is usual for a thick brown head to form upon the juice. Sometimes, however, an abundant white frothy head, similar to that seen in beer vats, is formed. It has been held that when the head was of a white frothy nature the cider made from it would not keep well. This opinion also has been found by the author to be erroneous, although no reason could be assigned as to why the head is sometimes white and sometimes brown. A white head, however, indicates a more rapid fermentation than a brown head and a tendency for the cider to become acid. For this reason it must be racked oftener than cider which throws up a brown head. When the cider throws up a white head it is necessary to keep the temperature of the room low. In racking from the keeve into barrels it has been found desirable to filter the cider. The author has found the Invicta filter one of the best for this purpose.

After the cider has been racked from the keeve into barrels the question arises as to whether the barrel should be bunged down or not. In one experiment the specific gravity of the juice when barreled was 1.052, acid content 0.7, alcohol 0.0, sugar 10.8, and total solids 12.82 per cent. It was then bunged down tightly in the barrel. After 2 months the specific gravity was 1.010, acid 0.85, alcohol 4.55, sugar 1.87, and total solids 3.8 per cent; showing that fermentation had taken place in the tightly bunged barrel as rapidly as in a barrel of like juice which had not been bunged down. It was found that the pressure in the bunged barrel was about 2 lbs. per square inch, and that consequently the gas which had accumulated in fermentation must have escaped through the staves in the top of the barrel. From this and other experiments it is concluded that the juice should not be bunged down when racked from the keeve, but provision made for the escape of the gas in such manner that air can not be admitted to the barrel. As fermentation proceeds in the barrel lees are

formed. A better quality of cider was produced when the fermented juice was racked off from the lees before final storage instead of bunging down with the lees left in the barrel. Experiments in clearing the cider by sulphuring, and the use of such materials as blood, milk albumin, and other materials showed no advantages in their use and invariably cider which had not been clarified with finings proved superior in quality to cider which had been so clarified. Racking, however, was found very desirable. The time to rack was found dependent upon the kind of fermentation and not upon the amount of fermentation. In the author's opinion it should be racked and finally bunged down when the juice contains about 3 per cent of sugar. A table has been prepared by the author showing the percentage of sugar and alcohol in fermenting juice, when the specific gravity of the original juice is known. A cider made by blending 2 or 3 different kinds of apples has been found most desirable. The blended juice should be racked once before filtration. "Never blend after filtration." By blending a standard quality of cider may be obtained, which is impossible without blending. In storing cider it has been found best to lay the barrels down on the side. Air is less likely to be admitted in this position than when the barrel is stood on end, and hence the cider is less likely to become acid. When cider is bottled the best results have been obtained when bottled immediately after it has been blended, racked, and filtered. Bottling direct from the filter has produced a cider of far better quality than bottling from a cask 2 months later. Bottling cider which contains over 4 per cent of sugar has been found to be dangerous, as subsequent fermentation is sufficient to break most of the bottles. As a rule, the specific gravity of cider which is bottled must not be higher than 1.025, and must not contain less than 4 per cent of alcohol. When these conditions are satisfied the gravity must next be regulated according to the desire to make sweet, medium, or dry cider. For a dry cider the liquid when bottled should contain only about 2 per cent of sugar, which corresponds nearly always to a specific gravity of 1.010.

A number of experiments were made in the production of "small cider." Small cider is made by adding water to the cheese obtained in the first pressing and repressing. The amount of water which it is desirable to add to the pressed pomace was found to be about one-half of the amount of juice originally obtained from the pomace. No special advantage was found from regrinding the pomace, but the results indicated that the pomace ought to soak for at least 24 hours. As to whether hot or cold water should be used, the results seem to show that from a chemical standpoint the hot extraction is the better when it can be carried out in cold weather, but in warm seasons cold water is better because fermentation can be more readily controlled. The extraction thus obtained is deficient in both sugar and tannin. To remedy these defects it has been found desirable to add about 5 per cent of pure cane sugar and about ½ lb. of tannin to each 1,000 lbs. of juice. Pure cane sugar has been found better for this purpose than either "saccharum" or "sugar candy." Relative to the addition of tannin, it is stated that when this is added to juice obtained by the cold process of extraction the tannin acts as a precipitating agent and does not remain in the juice. With the hot-made small cider it does not cause precipitation and remains in solution. In case of the cold-made juice, therefore, the tannin must be added after clarification.

When proper control was exercised in the matter of fermentation it was found that as good cider could be obtained from the early fallen fruit as from late fruit.

Many preservatives have been tried in making cider, such as mustard, formic aldehyde, boracic acid, sodium salicylate, pasteurizing, and various patent preservatives. With all of these except formic aldehyde, whether the cider was preserved in bottles or barrels, fermentation continued nearly as rapidly as when no preservatives were added; and in no case was as good cider made as when preservatives were omitted entirely. While the formic aldehyde prevented fermentation, it caused the cider to become opaque and like very dirty milk.

After the primary alcoholic fermentation is completed, a slow secondary fermentation sets in, during which the beverage mellows and improves in quality. One of the results of this secondary fermentation was found to be a decrease in the acidity of the cider.

The effect of various yeasts on the production of cider was studied. Yeasts obtained from black grapes, white grapes, Kingston-Black apples, Gin apples, and cider yeasts from foreign sources, respectively, were used to inoculate cider. In every instance a different quality of cider was produced. The best quality of cider was obtained by blending the natural juices which had been fermented without the addition of selected yeasts, strict attention being given to cleanliness. It is believed, however, that in order to make cider of the best quality it will be necessary to secure pure yeast cultures from the apples which grow in the neighborhood. In the use of pure yeasts it was found that the juice fermented more slowly, kept clearer, and the sugar could be retained longer in it than when the juice was allowed to ferment naturally.

Experiments with oily cider tended to show that the organism causing the disease belonged to the anærobic order. Thorough aerating of the cider tended to improve its quality. Much of the "sick" cider which the author examined was found to contain sulphuretted hydrogen, which developed as a result of sulphuring the barrels. The flavor of cider was found to be greatly influenced by the quantity of nonfermentable constituents present. When undiluted apple juice was fermented in comparison with the same juice diluted with one-half its own volume of water and sufficient sugar then added to make the liquid contain the same amount as the whole juice, the resulting cider from the diluted juice had a much better flavor than that from the whole juice. Flavor is also influenced by the nature of the fermentation, as was shown when yeasts of different origin were employed in fermentation. Bacteria rather than yeasts appeared to be the main cause of those changes generally designated as secondary fermentation or ripening of cider. It is believed, as the result of 10 years' work, that the secret of success in cider making, as in dairying, is cleanliness.

Making unfermented wine (*Agr. Gaz. New South Wales, 14 (1903), No. 3, p. 256*).—Practical directions for preparing unfermented grape juice.

Alcoholic fermentation in the presence of sulphurous acid, A. LEBEDEV (*Selsk. Khoz. i Lyesov., 208 (1903), Jan., pp. 194–200*).—The author reports experiments in which satisfactory fermentation was obtained in wine must containing 1 gm. of sulphurous acid (SO_2) per liter.—P. FIREMAN.

The technology of sugar, J. G. MCINTOSH (*London: Scott, Greenwood & Co.; New York: D. Van Nostrand Co., 1903, pp. XIV + 408, figs. 83*).—Different sections of this book deal with classification of sugars, beet sugar, cane sugar, sugar refining, and selection of sugars.

Manual guide for the manufacture of sugar, R. TEYSSIER (*Manual guide de la fabrication du sucre. Paris: C. Naud, 1904, pp. 425, figs. 129*).—This book is said to be intended for the use of sugar makers, directors, and chemists of sugar factories, etc., and more especially for managers and overseers.

Decorticating ramie (*Indian Agr., 28 (1903), No. 7, p. 217*).—A patented method based upon the use of more or less concentrated sea water or a solution having the approximate composition of sea water for freeing the fiber from gummy substances is briefly described.

A short text-book of chemical technology, G. SCHULTZ and J. HOFER (*Kurzes Lehrbuch der chemischen Technologie. Stuttgart: Ferdinand Enke, 1903, pp. 364, figs. 151*).—The subjects treated in this book are fuels and the generation of heat; water; sulphur and sulphur compounds; alkali salts; hydrochloric and nitric acids; inflamables and explosives; commercial fertilizers; cement, mortar, and artificial stone; glass and waterglass; pottery and porcelain; metallurgy; fats and oils; soaps, waxes,

etherial oils; caoutchouc and gutta-percha: dry distillation: coloring matters: sugar making; wine making; beer brewing; distillation of spirits; and leather.

Agricultural technology, including sugar making, milling, baking, and starch and glucose making, E. SAILLARD (*Technologie agricole, sucrerie, meunerie, boulangerie, féculerie, amidonnerie, glucoserie. Paris: J. B. Baillière & Sons, 1903, pp. 423, figs. 163; rev. in Prog. Agr. et Vit. (Éd. L'Est), 24 (1903), No. 43, pp. 502, 503*).—This volume, which is one of the series entitled *Encyclopédie agricole*, describes in detail some of the industries dependent upon agriculture. The introduction is by P. Regnard.

AGRICULTURAL ENGINEERING.

Irrigation, W. J. ALLEN (*Agr. Gaz. New South Wales, 14 (1903), No. 12, pp. 1143–1148, figs. 3*).—A brief general discussion of the value of irrigation as an insurance against drought, and an account of results obtained by irrigation with artesian water at Pera Bore, near Bourke, New South Wales.

Desert irrigation in the far West, L. R. FREEMAN (*Amer. Mo. Rev. of Reviews, 29 (1904), No. 3, pp. 305–311, figs. 10*).—A popular account of irrigation in southern California, mainly in the region of Imperial.

Irrigation and drainage, E. RISLER and G. WERY (*Irrigations et drainage. Paris: J. B. Baillière & Sons, 1904, pp. 516, figs. 126*).—This is one of the volumes of *Encyclopédie agricole* published under the direction of G. Wery. It discusses the interrelations of water, soil, and plant; the occurrence of water in different geological formations; the use of water in agriculture; and protection against water (drainage).

Proceedings of the Iowa State Drainage Convention (*Proc. Iowa State Drainage Conv. 1904, pp. 48, fig. 1*).—Proceedings of the convention held at Iowa State College January 15 and 16, 1904. While general drainage questions were discussed to some extent, attention was mainly given to the subject of drainage laws, and a committee was appointed to draft a law for Iowa and to urge its passage.

Drainage of farm lands, C. G. ELLIOTT (*U. S. Dept. Agr., Farmers' Bul. 187, pp. 40, figs. 19*).—A revised edition of Farmers' Bulletin 40, Farm Drainage, issued in 1896 (E. S. R., 8, p. 351).

Laws relating to construction of drains, with an appendix of blank forms (*Lansing, Mich.: Secretary of State, 1903, pp. 144*).—A compilation.

A system of waterworks for the farm, C. GRAY (*Iowa Agr., 4 (1904), No. 5, pp. 196–200, figs. 2*).—The air-pressure system is described.

The disposal of sewage from private residences, A. MARSTON (*Iowa Agr., 4 (1904), No. 5, pp. 204, 205, fig. 1*).—A simple system using a series of underground septic tanks made of barrels is described.

Hydrometry, a practical guide to water measurements, W. MÜLLER (*Hydrometrie, praktische Anleitung zur Wassermessung. Hannover: Jänecke Bros., 1903, pp. VI+150, pls. 3, figs. 81*).—Discusses the newer methods, apparatus, and experiments.

Second annual report of the State Board of Public Roads of the State of Rhode Island, 1903 (*Providence, R. I.: State Bd. Pub. Roads, 1904, pp. 35, pls. 29*).—This is a summary of the operations of this Board during the year 1903 under provision of the act of 1902 establishing a State highway system in Rhode Island and appropriating $100,000 for the construction, maintenance, and improvement of the highways of the State. Various sections of highways completed or in course of construction in Providence, Newport, Kent, Washington, and Bristol counties are described and illustrated. For the year 1904 the Board recommends an appropriation of at least $125,000.

A government cement-making plant (*Engineer. News, 51 (1904), No. 8, pp. 177, 178*).—A discussion of the proposed plant in connection with the construction of the reservoir dam in Salt River Valley.

Grain pressures in deep bins, J. A. JAMIESON (*Engineer. News, 51 (1904), No. 10, pp. 236–243, figs. 9*).—The detailed results of tests on full-sized bins of a railway elevator and on model bins are reported and discussed. A method of calculation of the pressure is explained which gives results closely agreeing with those obtained in actual tests.

A sanitarium for wheat, A. INKERSLEY (*Amer. Inventor, 12 (1904), No. 6, pp. 123–125, figs. 6*).—This is an account of an elevator on the northwestern end of Lake Superior near Port Arthur, Ontario, which is designed "for treating diseased and wet wheat in whatever manner its condition demands." It is provided with coils and fans for heating and drying the wheat and for removing smutty and other diseased grains.

The electric plow, F. BRUTSCHKE (*Deut. Landw. Presse, 31 (1904), No. 13, pp. 99, 100, fig. 1*).—A brief note on the recent progress in construction and use of the electric plow.

A fiber machine, G. CARLE (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 1, pp. 5–7*).—A short account of tests of the Boeken fiber machine on a variety of plants.

A beet header and harvester, PYRO (*Ing. Agr. Gembloux, 14 (1904), No. 7, pp. 287–303, figs. 6*).—A machine for removing the tops of beets while they are still in the ground, and another for harvesting the topped roots, are described.

Agricultural machinery in the United States and the wages of labor, F. BRUTSCHKE (*Die landwirtschaftlichen Maschinen in den Vereinigten Staaten von Amerika und der Arbeiterersatz. Berlin: Deut. Landw. Gesell., 1904, pp. 79, figs. 62*).—This is an account of a tour of inspection through the United States, and deals with general agricultural conditions as well as the special forms of farm machinery used in different parts of the country.

MISCELLANEOUS.

Fourteenth Annual Report of Arizona Station, 1903 (*Arizona Sta. Rpt. 1903, pp. 315–350*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; and reports of the director and heads of departments, containing a general review of the work of the station, and more detailed reports upon special lines of work which are noted elsewhere in this issue.

Fifteenth Annual Report of Connecticut Storrs Station, 1903 (*Connecticut Storrs Sta. Rpt. 1903, pp. 202*).—This includes the organization list of the station; a list of station publications available for distribution; financial statements for the fiscal years ended June 30, 1902 and 1903; reports of the director for the two years; departmental reports; and miscellaneous articles abstracted elsewhere.

Annual Report of Florida Station, 1902 (*Florida Sta. Rpt. 1902, pp. 29*).—This includes the organization list of the station; a report of the director; a financial statement for the fiscal years ended June 30, 1901 and 1902; a subject list of the bulletins of the station; and reports of the agriculturist, chemist, entomologist, botanist and horticulturist, and the veterinarian, covering in a general way the different lines of station work during the year. The report of the agriculturist contains also the results of a feeding experiment with steers (see p. 893); and the report of the chemist, an analysis of the edible portion of the avocado or alligator pear, which is as follows: Water 72.77, protein 2.18, fat 17.26, crude fiber 1.87, nitrogen-free extract 4.47, and ash 1.45 per cent.

Sixteenth Annual Report of Georgia Station, 1903 (*Georgia Sta. Rpt. 1903, pp. 12*).—This includes the organization list of the station; a statement by the president of the board of directors; a general review of station work during the year, by the director; and a financial statement for the fiscal year ended June 30, 1903.

Sixteenth Annual Report of Indiana Station, 1903 (*Indiana Sta. Rpt. 1903, pp. 34*).—This includes the organization list of the station; reports of the director and

heads of departments; lists of exchanges and station publications, and a financial statement for the fiscal year ended June 30, 1903.

Twelfth Annual Report of Kentucky Station, 1899 (*Kentucky Sta. Rpt. 1899, pp. XL*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1899; and reports of the director and heads of departments, parts of which are noted elsewhere. Appended to the report proper are reprints of Bulletins 80–85 of the station on the following subjects: Some pests likely to be disseminated from nurseries, and the nursery inspection law (E. S. R., 11, p. 169); a method of avoiding lettuce rot (E. S. R., 11, p. 261); potato scab experiments made in 1898 (E. S. R., 11, p. 260); commercial fertilizers (E. S. R., 11, p. 627); wheat (E. S. R., 11, p. 731); the elms and their diseases (E. S. R., 12, p. 157); and commercial fertilizers (E. S. R., 12, p. 130).

Sixteenth Annual Report of New York Cornell Station, 1903 (*New York Cornell Sta. Rpt. 1903, pp. L+452*).—The report proper includes the organization list of the station; a report of the director; a financial statement for the fiscal year ended June 30, 1903; reports of the heads of departments; and reports on cooperative experiments in progress.

Appendix I contains reprints of Bulletins 203–211 of the station on the following subjects: The care and handling of milk (E. S. R., 14, p. 387); cooperative experiments on the cost of egg production (E. S. R., 14, p. 486); shade trees (E. S. R., 14, p. 452); sixth report of extension work (E. S. R., 14, p. 616); pink rot, an attendant of apple scab (E. S. R., 14, p. 668); the grape-root worm—further experiments and cultural suggestions (E. S. R., 14, p. 888); distinctive characteristics of the species of the genus Lecanium (E. S. R., 14, p. 887); commercial bean growing in New York (E. S. R., 14, p. 959); and cooperative poultry experiments—the yearly record of three flocks (E. S. R., 15, p. 178). Appendix II contains a detailed financial statement for the fiscal year ended June 30, 1903; and Appendix III, reprints of Reading Lessons for Farmers' Wives, Nos. 6–10; Home Nature Study Course, Nos. 25–32; and 11 numbers of the Junior Naturalist Monthly, issued during 1902 and 1903. A list of the publications of the station and of the extension department of the college of agriculture is appended.

Sixteenth Annual Report of South Carolina Station, 1903 (*South Carolina Sta. Rpt. 1903, pp. 26*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; and departmental reports reviewing the different lines of station work during the year. The report of the chemist contains a summary of the results of fertilizer inspection during a number of years, but more particularly during 1902 and 1903.

Sixteenth Annual Report of Tennessee Station, 1903 (*Tennessee Sta. Rpt. 1903, pp. 89–104, figs. 2*).—This includes the organization list of the station; a report of the director on the staff, policy, lines of work, equipment, and needs of the station; departmental reports summarizing briefly the different lines of station work; and a financial statement for the fiscal year ended June 30, 1903.

Eleventh Annual Report of Washington Station, 1901 (*Washington Sta. Rpt. 1901, pp. 8*).—A report of the director, and a financial statement for the fiscal year ended June 30, 1901.

Twelfth Annual Report of Washington Station, 1902 (*Washington Sta. Rpt. 1902, pp. 12*).—Reports of the director, agriculturist, horticulturist, and veterinarian; and a financial statement for the fiscal year ended June 30, 1902.

Fifteenth Annual Report of West Virginia Station, 1902 (*West Virginia Sta. Rpt. 1902, pp. 35*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1902; and a report of the director reviewing the different lines of station work during the year.

Eighth Annual Report of the Pennsylvania Department of Agriculture, 1902, II (*Pennsylvania Dept. Agr. Rpt. 1902, pt. 2, pp. 328*).—This includes the

proceedings of the meetings of the board of agriculture held during the year, and of the annual meeting of the State horticultural association. Papers selected from those read before the horticultural society and at farmers' institutes are also included, as well as lists of the officers of the various agricultural organizations in the State.

Experiment Station Work, XXIII (*U. S. Dept. Agr., Farmers' Bul. 186, pp. 32, figs. 9*).—This number contains articles on the following subjects: Losses in manure, macaroni wheats, sterilizing greenhouse soils, tomatoes under glass, protection of peach buds, dandelions in lawns, apple pomace for cows, rations for laying hens, early molting of hens, evaporation from incubator eggs, the keeping quality of butter, and curing cheese in cold storage.

Experiment Station Work, XXIV (*U. S. Dept. Agr., Farmers' Bul. 190, pp. 32, figs. 14*).—This number contains articles on the following subjects: Cost of eggs in winter, the chicken mite, soiling crops, profitable and unprofitable cows, methods of milking, coating cheese with paraffin, the octagonal silo, ventilation of stables, and disposal of diseased carcasses.

Timely hints for farmers (*Arizona Sta. Bul. 47, pp. 295–317, figs. 2*).—This is made up of reprints of press bulletins issued during the period from October 20, 1902, to May 1, 1903, treating of the following subjects: Strawberry culture (see p. 873), skim milk for pigs (see p. 900), watermelon growing (see p. 870), combating the flat-headed borer, the melon plant louse and the "manteca" disease, and the use of branding fluid (see p. 893).

Southern agriculture; its condition and needs, D. D. WALLACE (*Pop. Sci. Mo., 64 (1904), No. 3, pp. 245–261*).

Agriculture in Austrian Alpine regions, V. ZAILER (*Inaug. Diss., Univ. Jena, 1903, pp. 138*).—The geography, geology, climate, population, labor conditions, and land ownership of these regions are described in a general way, and the cultivation of the soil and management of orchards, vineyards, meadow lands, and forests are treated more in detail. The raising of horses, cattle, and other live stock is discussed and special attention is given to the mountain dairy industry.

Yearbook of the German Agricultural Association, 1903 (*Jahrb. Deut. Landw. Gesell., 18 (1903), pp. XVIII+716*).—This contains the proceedings of the different meetings of the association held during 1903.

NOTES.

Alabama College and Station.—N. C. Rew, a graduate of the Iowa State College of Agriculture and the Mechanic Arts, has been appointed assistant in animal industry in the college and station, vice J. M. Jones, who has resigned to engage in farming in Alabama.

California Station.—J. H. Barber, formerly superintendent of the Sierra Foothill Station at Jackson, has been transferred to the Pomona Substation, where he has become assistant superintendent. The superintendent of the latter station also has charge of cooperative experiments carried on in the orange groves of southern California. H. J. Quayle, assistant entomologist, has been for some time investigating the scale insects of the prune orchards at Hanford, in the San Joaquin Valley. The Watsonville Orchard Association has provided funds for the continuation of the codling moth investigations which were begun last year by Prof. C. W. Woodworth and his assistants with the cooperation of the association. The San Rafael Improvement Club has inaugurated a campaign of extermination against the mosquito pest under the direction of the station entomologist. A small shed adjoining the station building, once used as a stable, has been fitted up with office and laboratories for the bacteriological and veterinary department, which has given up its rooms in the main building to the viticultural department.

Connecticut College.—The third annual summer school for teachers and others in nature and country life will be held July 6 to 29, 1904. Instruction by specialists will be provided in ornithology and entomology, botany, floriculture, landscape gardening, forestry, fruit and vegetable growing, dairying, poultry culture, and other farm operations. There will be special lectures by Dr. C. F. Hodge of Clark University, Dr. M. A. Bigelow of Teachers' College, Columbia University, and several principals of the State normal training schools.

Hawaii Station.—An examination of soils by E. C. Shorey, the station chemist, shows nitrogen to be present in the form of pyridine compounds. Several compounds have been identified and one has been isolated. The subject is being further investigated. Dr. Shorey finds from an examination of the bark of the wattle (*Acacia decurrens*) that this bark carries 29 per cent of tannin. The station has about 15 acres of Acacia trees on its grounds.

Iowa College and Station.—The State legislature has made the following appropriations for the college and station: For additional maintenance fund, $50,000 annually; for completing the central building, $95,000; for beginning the construction of a heating plant, $54,500; for a dairy building, $45,000; equipment for the same, $10,000; for a new dairy farm, $22,000, and equipment of the same, $7,000; poultry department, $500; additional maintenance for the experiment station, $15,000 annually; good roads investigations, $3,500 annually; and engineering investigations, $3,000 annually. The above appropriations include an aggregate of $84,000 for the dairy department. Plans for the dairy building are now being made, and it is hoped that the building may be completed in the early fall. W. H. Olin, of the station, has arranged with A. E. Cook, proprietor of the Brookmont Farms, near Odebolt, for a cooperative experiment with clover. This will be a practical test on a business scale of raising clover, using oats, barley, and corn as nurse crops. Nineteen hundred and

twenty acres, 3 full sections, will be used in the experiment, the seed and labor being furnished by Mr. Cook, while the station will supervise the work and make accurate observations on the growth of the clover under the different conditions of seeding. A cooperative experiment is also in progress at the same farm in growing barley of 3 varieties, specially selected seed of each being used. The experiment covers 900 acres. P. G. Holden, agronomist, conducted a 3-days' special train tour in northern Iowa in April, for the purpose of giving instruction on seed corn and improved methods of corn growing. A special train was provided by one of the railroad companies, and addresses of 20 minutes were made at various points, a long day coach being used as the lecture hall. In this car were arranged charts, samples of seed corn, and other material for illustrating the lectures on corn and the methods of seed selection. This novel undertaking was eminently successful, and large crowds of farmers gathered to listen to the addresses. The newspapers speak enthusiastically of the enterprise and the benefits which may be expected to follow.

Mississippi Station.—The recent legislature appropriated $14,000 for a substation at McNeill for the period of two years, and also provided for the establishment of two other branch stations, one in the brown loam and one in the Delta region. An appropriation of $3,000 was made for each of these stations to start the work. This, together with the contributions of the communities in which the stations are located, will enable the work to be organized.

Cornell University.—The bill appropriating $250,000 for buildings and equipment for the college of agriculture was passed by both branches of the legislature previous to adjournment. The opposition to it, previously noted, was continued before the governor, but the latter signed the bill early in May. The university will add about $40,000, making a grand total of $290,000 for buildings. The university will take over the dairy building and adapt it for other purposes, and a new site adjacent to the veterinary department and the college farms will be selected for the agricultural buildings.

Porto Rico Station.—F. D. Gardner, who has been in charge of the station since its organization, has resigned to reenter the service of the Bureau of Soils, in charge of soil management. He is succeeded by D. W. May, formerly connected with this Office, and for two years past at the head of the department of animal husbandry in the Kentucky Station. Mr. May is a graduate of the Missouri Agricultural College, where he spent some time in postgraduate work and served for a period as farm superintendent. He has had experience in southern New Mexico and has considerable familiarity with subtropical agriculture. He brings to his work a thorough understanding of the spirit and methods of experiment station work, a working knowledge of the Spanish language, and good administrative ability, which will stand him in good stead in his new station. G. P. Clinton, of the Connecticut State Station, has spent several weeks in the island investigating the diseases of citrus fruits, coffee, and other products.

Rhode Island College.—The legislature has appropriated $3,000 for repairs to the college buildings, and increased the appropriation for labor fund and demonstration work, which last year was $3,000, to $4,000, to be divided equally between these two objects.

Vermont College.—C. L. Stygles has been appointed dairyman, vice E. S. Gregg.

Wisconsin University and Station.—Charles W. Stoddard has been appointed instructor in agricultural physics to succeed F. J. Wells, who, as previously noted, died early in March. Mr. Stoddard was reared upon a farm in Wisconsin, and is a graduate of the Brooklyn Polytechnic Institute and Columbia College, where he also spent some time in postgraduate work. His training has been especially along the lines of chemistry, physics, and plant physiology.

A New Plant Introduction Garden.—The Bureau of Plant Industry of this Department has established a plant introduction garden at Chico, California. The great increase in the work of plant introduction during the past two years, and the

systematizing of the introduction and distribution of seeds and plants, have made the need of better facilities for caring for, propagating, and testing introduced plants and seeds imperative. After a thorough examination of different parts of the State of California by P. H. Dorsett, William Taylor, and W. W. Tracy, of this Department, assisted by A. V. Stubenrauch of the California Station, Chico was finally selected as the site of the garden; and a tract provided by the county for that purpose has been turned over to the Department. Chico is located in Butte County in the northern part of the State, nearly 100 miles north of Sacramento. The State has maintained a forestry station there for a number of years. While the climate is too severe for the safe propagation of citrus fruits less hardy than the lemon, the general conditions of climate and soil are such as to promote an extraordinarily healthy growth of all other plant life. It is thought that the Chico climate will be representative of a much larger range of available territory than the forestless regions farther south. The question of water was also an important item in selecting a location; at Chico the necessity for irrigation will be confined to annual crops and newly planted trees, and established trees will not require irrigation.

It is the intention of the Bureau of Plant Industry to gather at this garden a large and representative collection of economic plants of all kinds, more particularly of fruits, and to propagate such new varieties as are found worthy of further introduction, at least to the extent necessary to make a preliminary distribution. As the collection increases the garden will afford valuable facilities for plant breeding and for studies in botany and horticulture, such as can only be carried on where a wide range of plants are available. The garden will also be used very largely for planting small samples of seeds, in order to increase the stock of seed sufficiently for a preliminary distribution. In the past, when only small quantities of seed have been available, these have frequently been lost in the first test, so that even if the test proved favorable a further trial could not be made. In future it is planned to grow an increased supply of all the small lots of seeds which are introduced before any distribution is made, so that a small quantity of stock seed may be kept on hand to fall back upon, in case the variety proves desirable and it is not practicable to secure the seed elsewhere. Work at the new garden has already been commenced, with P. H. Dorsett in charge as superintendent.

In addition to the above garden, the Bureau has arranged for the following testing stations in different parts of the country. A palm garden has been located on a tract of 15 acres of land at Mecca, in the Colorado Desert, where the different varieties of date palms will be tested, and also other plants adapted to those regions under irrigation, the water being furnished by an artesian well. The city of San Antonio, Tex., has turned over to the Bureau 125 acres of land near that city, and the local water company has agreed to furnish abundant water for irrigation free of charge. This will give opportunity for testing plants in the semiarid belt, and also for work in plant breeding and selection. At North Galveston, Tex., the Department has acquired a tract of 60 acres of land to be used primarily as a rice farm. This farm lies in the prairie belt of Texas, where abundant irrigation water is easily available, and where rice can be grown and harvested by machinery. All the varieties of introduced rice are being tested at this place, as well as other crops adapted to the conditions. The pine woods farm, including 160 acres of land at De Quincy, La., is representative of the pine woods region in which the soil is thin and underlaid with hardpan, making it difficult to cultivate the ordinary crops. At this farm the plants and cultural methods suited to the region, which extends more or less throughout the Gulf States, are to be worked out. Four cereal testing stations are being maintained—one each in Texas, Nebraska, North Dakota, and South Dakota. These latter are more or less temporary in nature and will be abandoned as soon as the work there is completed. The Bureau continues to maintain a subtropical garden at Miami, Fla.

California Polytechnic School.—A copy of the second annual catalogue of this school has been received from Dr. Leroy Anderson, the director. The school, it will be remembered, opened last September, and the catalogue shows twenty students in attendance. Courses of study, with practical work, are offered in agriculture, mechanics, and domestic science. A temporary dairy room and a carpenter shop are fitted up in the basement of the main building, and there are lecture and laboratory rooms for chemistry and physics, botany and entomology. The farm consists of 280 acres of land and contains a small orchard of apples, oranges, limes, and grapes. A good beginning has been made with live stock, and it is planned ultimately to produce all the dairy and poultry products used by the school upon the farm. The auspicious opening of the school and the fact that it has attracted students from quite a distance is encouragement for the belief that a career of wide influence and usefulness is open to it.

Agricultural Education and Research in India.—The previous announcement (E. S. R., 15, p. 733) regarding the establishment of an institution for agricultural education and research at Pusa, in the Darbhangah District of Bengal, with an endowment provided by Mr. Henry Phipps, of Pittsburg, is confirmed by an article in the London *Times*, which is noted in *Nature* for April 7 and *Science* for April 22. The college is to be known as the Imperial Agricultural College, and it is hoped will be ready to receive students a year from next fall. The principal of the institution is Mr. Bernard Coventry, who has been manager of the Dalsingh Serai estate. The staff of the station is to consist of 2 chemists—one being also a bacteriologist, 2 botanists—one cryptogamic and the other "biological," and an entomologist. In commenting upon the new institution *Nature* says:

"This scheme ought to grow into an institution of the utmost value to India, a country which is full of agricultural industries, involving great interests, yet proceeding wholly by rule of thumb tempered by occasional analyses performed in London. Systematic investigations of the conditions of the industry on the spot have been wanting except latterly among the tea planters of Ceylon and Assam. Indigo growing affords a case in point; for years it was obvious that the natural product was going to meet with severe if not ruinous competition, yet nothing was done until the artificial indigo had reached the position of being able to undersell the Indian article, then at last a chemist and a bacteriologist were hurried out to try to save the failing industry. . . . The new institute at Pusa will be well situated among some of the best agricultural developments in India, so that the scientific staff will have an opportunity of learning where their skill can be of service to the cultivator, and of trying to keep this or that industry in a healthy condition instead of being called upon to resuscitate it when in extremis. There may be even now a chance for the grower of indigo if only he is given some of the systematic scientific effort which has hitherto been the monopoly of his competitor."

Agricultural Schools in Brazil.—Milton M. Underdown, writing in *The Country Gentleman* for April 28, 1904, describes the conditions respecting agricultural instruction in Brazil, and the ups and downs of one practical school in particular. He speaks of the state experiment station at São Paulo as "a very creditable institution," but his general account of the condition of agricultural education in that country is not encouraging.

Miscellaneous.—Prof. F. Lamson-Scribner has resigned his position as Chief of the Bureau of Agriculture of the Philippines and has reentered the service of this Department in the Bureau of Plant Industry. He will be in charge of the latter's exhibit at St. Louis during the exposition.

Hon. Levi Stockbridge, for many years professor of agriculture at the Massachusetts Agricultural College, died at the home of his son, Dr. H. E. Stockbridge, Lake City, Fla., May 3, after a short illness. He was 84 years of age.

Dr. J. Wortmann, the director of the horticultural academy at Geisenheim, has lately been made an advisory member of the German Health Office on questions relating to agriculture and forestry. He succeeds Dr. R. Goethe, also his predecessor in office at Geisenheim, who has retired.

A joint resolution providing for the printing of the annual report of this Office was passed by Congress a few days before adjournment. It provides for 8,000 copies of the report, 5,000 of which will be for the use of the Department, and makes it one of the reports to be prepared and published annually without further provision of Congress. This report contains the review of the work and expenditures of the experiment stations, reports on the work in irrigation and nutrition, and miscellaneous papers relating to agricultural education and experimentation.

Among the bills presented in Congress late in the session, which failed of passage, was one to establish an agricultural experiment station in the Sixth Congressional District of Mississippi, with an appropriation of $10,000; one to establish a system of primary schools of agriculture in the Territories and insular dependencies of the United States, to be located upon farms, and to give practical as well as theoretical instruction in farming, stock raising, farm engineering, and "the simple mechanic arts required in the country," the course of instruction to occupy not less than 5 years; and a bill to create a Bureau of Agricultural Education in the Department of Agriculture, for the purpose of devising the best methods of promoting agricultural education throughout the United States, and to study the conditions and needs of each Territory and the island possessions.

A bill for promoting agricultural education and nature study in public elementary schools has been introduced in the House of Commons, according to a note in *Mark Lane Express*. Its object is to provide for the teaching of agricultural and horticultural subjects, to give facilities for nature study, and generally by means of object lessons to cultivate habits of observation and inquiry on the part of the pupil. To this end it is proposed to maintain school gardens and collections of materials necessary for the practical illustration and application of the instruction given. These studies would be optional in urban schools, but compulsory in all schools situated in rural and semirural districts. The bill is said to have the support of several prominent members.

The Central Society for the Beet Sugar Industry in Austria-Hungary is preparing to celebrate the fiftieth anniversary of its establishment June 6, at its general meeting to be held in Vienna. The society was founded August 4, 1854, and now embraces all the sugar factories and refineries of Austria-Hungary. It maintains a chemical-technical experiment station for beet-sugar manufacture, with a commercial laboratory, under the directorship of Friedrich Strohmer, located in the society's building in Vienna, which also serves as headquaters for the numerous sugar organizations.

A departmental committee has been appointed by the president of the board of agriculture for the double purpose of inquiring into and reporting upon the present condition of fruit culture in Great Britain, and of taking steps to advance and encourage the industry.

The Association of German Scientists and Physicians will meet this year at Breslau, September 18–24.

Flora and Sylva is the title of a new English publication, Vol. I, No. 1 of which appeared in April, 1903. It is a monthly review devoted to gardens, woodlands, trees, flowers, new and rare plants, and fruits. Special attention has been given to clear drawings and colored plates, to the use of large, clear type, and a high grade of paper. The magazine will be found especially valuable to botanists. The first nine numbers have been bound and indexed, and appear as Volume I.

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EXPERIMENT STATION RECORD.

VOL. XV. JUNE, 1904. No. 10.

An important phase of food and feeding stuff inspection is the determination of the nature of adulteration. The kind of materials employed as adulterants, and the extent to which foreign materials may occur naturally as impurities or are purposely admixed in the process of manufacture or preparation, is often of quite as much interest as the composition of the inspected products with reference to an accepted standard. While ordinarily harmless themselves, these materials are not selected on account of their healthfulness and are usually a dead weight, serving no useful purpose to the consumer. A knowledge of their general character and the means of detecting them strengthens the hands of those charged with the inspection, and aids in providing efficient laws to enable their control.

The materials employed as adulterants change from time to time, and are often of such a nature as to make their detection quite difficult. This is heightened by the variety of materials employed, by special preparation which alters their true character, and by the unexpectedness of their use. While some of them can be detected by chemical means, a large proportion require the use of the microscope, and for this purpose a knowledge of the anatomy and structure of a great variety of seeds and other parts of vegetable products, as well as of the food products themselves, is of the highest importance.

The histological studies which have been carried on for several years past by Mr. A. L. Winton, of the Connecticut State Station, constitute the most extensive and thorough investigations of the kind which have been reported in this country, and are worthy of special commendation both on account of their high character and their wide application. As furnishing a basis for the identification of admixed materials and studies of the nature of adulteration they are fundamental, and form a most important contribution to the development of food inspection work.

Mr. Winton's work in this line began several years ago at the Pharmacological Institute of the University of Gratz, Austria, under Prof. Josef Möller, who has given much attention to investigation of this character. The anatomy of the maize cob was studied with a view to the detection of ground cobs in wheat and rye bran. It soon became apparent that European investigators, who have accumulated the bulk of the information available to food chemists regarding the microscopic

structure of vegetable materials, had overlooked many distinctively American products with which we should be familiar. This first paper was followed by similar studies of the different parts of the cocoanut, the shells of which are extensively employed for adulterating spices, and of a variety of small fruits, including field and cultivated strawberries, raspberries, blackberries, currants, gooseberries, cranberries, and huckleberries. These studies of small fruits are of special importance in the examination of jams, preserves, and similar products.

Later, studies were reported on twelve varieties of sorghum, including broom corn, Kafir corn, durra, and milo maize, for the purpose of their identification when ground for cattle food or adulterants. In an investigation of American wheat screenings, the materials separated included broken and shriveled wheat, straw and chaff, dust, and the seeds of numerous weeds, among which black bindweed, green and yellow foxtail, darnel, and chess were especially studied. The last report of the station describes the anatomy of a number of oil-bearing seeds, such as hemp, upland cotton, sesame, madia, niger, and poppy seed, with special reference to the microscopic examination of cattle foods.

This partial list gives an idea of the scope and extent of Mr. Winton's investigation, and it should be added that a considerable number of important studies remain unpublished. In all of this work carefully executed drawings have been made of separate parts of the material under examination and their histological elements, which, together with the descriptive text, enable their identification in admixtures. To facilitate this and make the determination more certain, distinctive features have been sought out and special tests devised, and a convenient micropolariscope has been described; all of which characterizes the investigations as ingenious and painstaking to a degree, and thoroughly scientific in their execution.

The paucity of data which is applicable to the identification of materials used as adulterants of foods and feeding stuffs is rather surprising when we consider the wide interest in inspection work in this country. The number of books containing material of value in this connection is exceedingly limited. The results of isolated investigations in this country have been published from time to time in botanical and pharmaceutical journals, but much of this work is not applicable to the matter in hand, and it suffers from being fragmentary and widely scattered.

The Bureau of Chemistry of this Department has published some work bearing on the subject, and is at present devoting considerable attention to histological studies of food products and adulterants. The work which Mr. Winton has done, so far as it has been published, has appealed strongly to food chemists, and has been eagerly embraced by them and made a part of their working stock in trade. But the field is a broad one and the work of a time-consuming character.

Moreover, the attention which any single institution can devote to it is necessarily small, and as the results are of uniform value wherever food inspection is carried on in this country, it is too much to expect a single station to cover the whole field. While Mr. Winton is a pioneer in this work, he has not preempted the whole field, and would no doubt rejoice to see his efforts seconded at many places.

Investigation of this sort can not be regarded as strictly in the field of the chemist and need not be restricted to him. It is essentially botanical in its character and methods, and much valuable assistance could be rendered by botanists in conducting these histological studies, who would find in them a line of investigation of increasing interest and practical utility. Indeed, this would seem to be an inviting and profitable opening to young botanists seeking a special line of work, and afford greater opportunity for original contributions than some of the more hackneyed lines. The subject, however, is one in which prospective food chemists should perfect themselves, and it illustrates the growing importance of broad training for men who are to enter this field.

It is obviously impracticable in most institutions to divide the work of inspection, assigning the microscopical examination to a botanist and restricting the chemist to the chemical analysis. The most practical plan seems to be for one man to master both lines of work, and although he need not himself execute all of the details, he should be thoroughly familiar with them and competent to interpret the results. Such preparation calls for suitable courses of instruction, to which very little attention has yet been given in this country, although the subject has a recognized place in many continental universities. It calls for a combination of chemical and botanical studies, which are already on the curriculum of nearly every college and school of technology, but which are not as yet brought together so as to constitute a prescribed course. The growth of both State and Government work in the inspection of foods and feeding stuffs, as well as the increased employment of men of special training in packing houses, canneries, flouring mills, glucose factories, baking establishments, confectionery works, and the like, would seem to make it worth while for at least a few institutions to provide courses suited to the needs of such men.

The desirability of the analyst conducting some research work, to prevent him from getting into a rut and becoming a mere rule-of-thumb worker, is quite as apparent in this as in any other line of routine work. Studies of this character, which can be taken up at odd times, will do much to relieve the dull grind of routine analysis and to keep the chemist fresh for his work.

The death of Emile Duclaux removes a prominent and conspicuous worker in a field bordering closely on agriculture. His name is a familiar one to readers of this journal, for so much of his work in recent years related to some phase of agricultural science that special

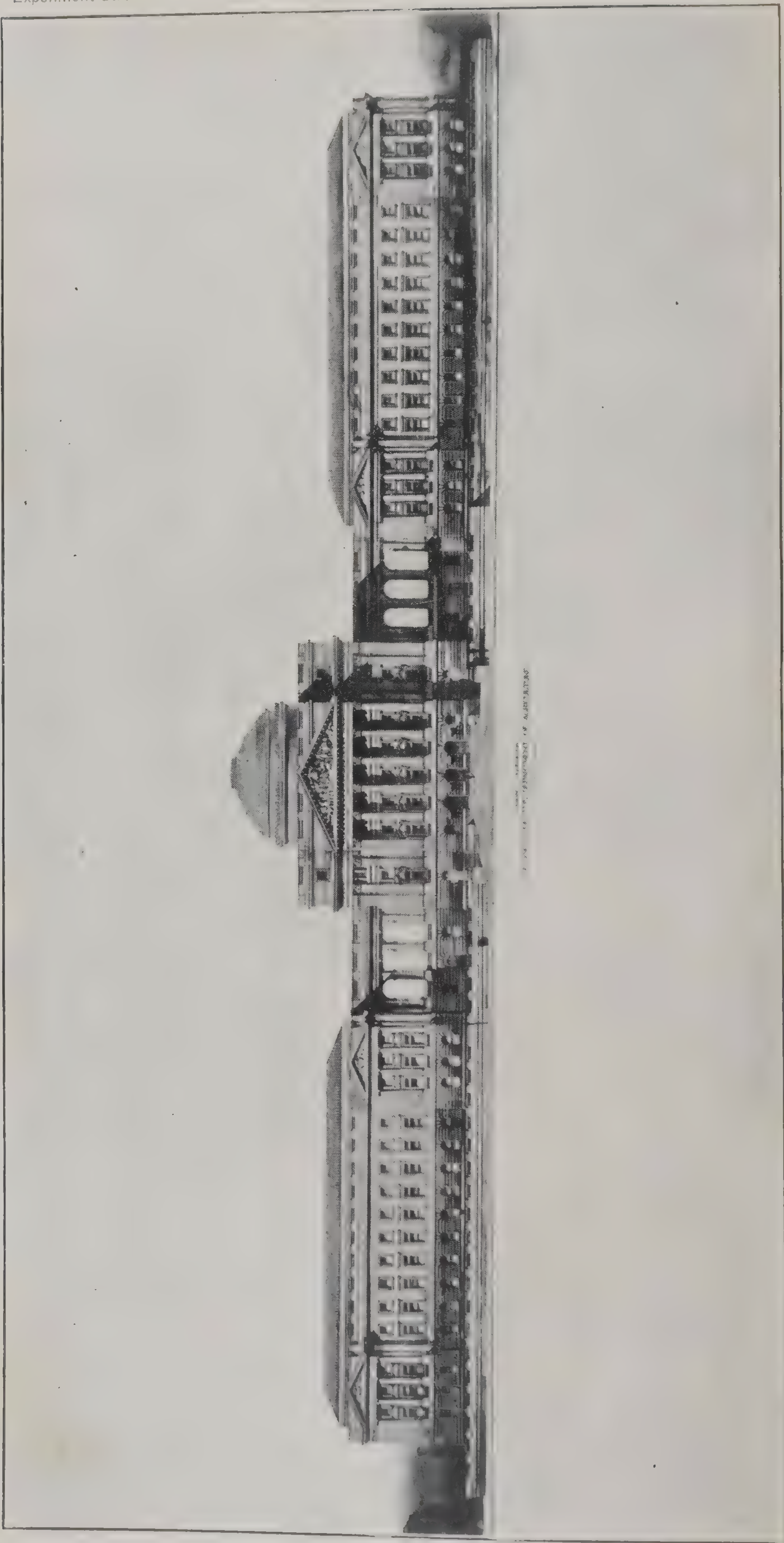
effort was made to follow it. Trained as a chemist and physicist, and with noteworthy contributions to his credit in both of these sciences, his most important work was biological and biochemic. In this respect he was like Pasteur, with whom he early became associated and whom he succeeded as director of Pasteur Institute upon the death of the great leader nine years ago.

Duclaux's training as an investigator was obtained under Pasteur at the École Normale, where he served as *préparateur* to Pasteur for about three years. He assisted the latter in his celebrated investigations on the causes of diseases in wines and upon silkworm diseases. He occupied successively the chairs of chemistry at Clermont, of physics at Lyons, and of physics and meteorology at the Institut National Agronomique in Paris. The latter position he accepted in 1878, and in 1888 he became titular professor of biology in the Sorbonne, which position he held at his death. He was also the head of the Laboratory of Fermentations, established in 1888 as a department of the Institut National Agronomique. With the establishment of the Pasteur Institute, his course of instruction and biochemic laboratory were transferred there. He founded the *Annales de l'Institut Pasteur* in 1887, in which many of his papers and reviews were published.

The list of Duclaux's original contributions to scientific journals contains upwards of eighty papers, and includes, besides technical articles on chemistry, physics, and meteorology, studies on ferments and fermentation, enzyms, the coagulation of albumen, the aging of wine, the chemistry of carbohydrates, the biology of the soil, the physiology of digestion, and the chemistry and bacteriology of dairying. On the latter subject he was for many years the leading investigator in France. He made extensive studies on the rancidity of butter and the relation of bacteria and molds to these changes; and he was prominent in the early stages of the discussion of cheese ripening, assigning an important place to the peptonizing lactic bacteria, to which he gave the group name of Tyrothrix species.

Duclaux also published two books on dairying which are standard, viz, *Principes de Laiterie*, which formed a part of the Encyclopedia of Agriculture and Horticulture, and *Le Lait, Études Chimiques et Microbiologiques*, the last edition of which appeared in 1894. His most important work was the *Traité de Microbiologie*, commenced in 1889, four volumes of which had appeared. The fifth volume was nearly completed at his death, and two more were contemplated.

While Duclaux will probably be best remembered by his researches upon enzyms and fermentation and the chemical processes associated with the life and activities of micro-organisms, his remarkable versatility brought him into a position of prominence in many lines, in which his name will long be associated with the history of investigation. His death occurred May 3, at the age of 64 years.



FRONT ELEVATION OF BUILDINGS FOR THE DEPARTMENT OF AGRICULTURE.

NEW BUILDINGS OF THE DEPARTMENT OF AGRICULTURE.

In 1901 Congress authorized the preparation of plans for an agricultural building, as a preliminary step toward securing adequate permanent quarters for the National Department of Agriculture. On the basis of plans and estimates which were made, an appropriation of two and one-half million dollars was asked, which the Congress of 1902 reduced to one and one-half million. With this reduced amount it was decided to provide laboratory and office accommodations for the bureaus and divisions occupying rented buildings, and to leave the administration building to be built later when further appropriation should be made.

A building committee consisting of Doctors B. T. Galloway, D. E. Salmon, and A. C. True was appointed by Secretary Wilson to consider in detail the special needs of the Department, and to arrange for building plans. Messrs. Rankin, Kellogg, & Crane, of Philadelphia, were selected as architects, and preliminary plans were drawn; but controversy arose over the location of the building, which involved the general plans of the commission for the beautification of Washington, and pending the decision little progress could be made in working out the details of the building.

A location was definitely determined upon early in May, 130 feet in rear (to the south) of the present main building, and fronting on the 890-foot parkway projected from the Capitol to the Washington Monument. The building will face north, and when completed will consist of an administration building as a central feature, with L-shaped wings on either side, the short arms of the wings extending to the rear. (Pl. III). This will occupy all the available space back to B street SW., and will necessitate the condemnation and closing of that street and a part of the square adjoining it when future extensions are made.

The location with reference to the present buildings is shown in fig. 10. It will be seen that, with the exception of the frame building used as a museum and several ranges of greenhouses, the buildings need not be disturbed for the present. The grass garden, which lies between the statistical building and the museum, will have to be moved, and the proximity of the vegetation house (V. H.) and a small building for photographing plants (P. G.) will necessitate their being done away with. The fireproof building used for storing records and documents, the stable, and other storage buildings will be left for the present. The museum contains numerous offices, and provision for these will be made in rented quarters, as the building will be torn down this summer.

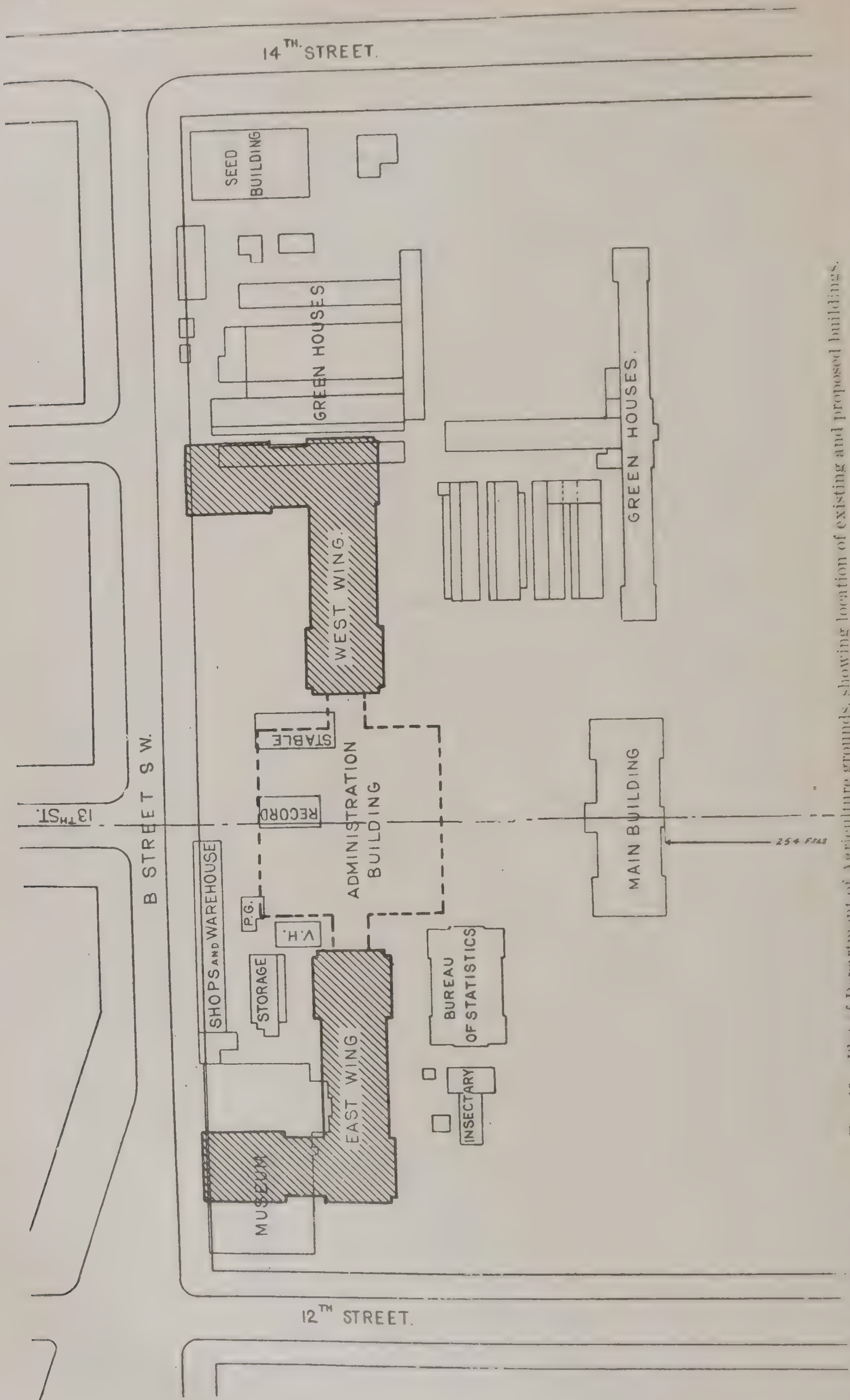


FIG. 10.—Plat of Department of Agriculture grounds, showing location of existing and proposed buildings.

The administration building will be designed solely for office and library purposes, and will be five stories high. The laboratories will be in the wings, which for the present at least will also contain some offices. Only the two wings are to be erected at this time, and these will appear as independent structures, separated by an opening of 220 feet. When these are connected by the administration building an imposing front of approximately 750 feet will be presented, the central building projecting 35 feet beyond the front line of the wings.

The wings will have a frontage of 256 feet each, and the ells will extend 100 feet from the front line to the rear. They will be four stories in height, above a high basement and a subbasement, and about 60 feet in width (from front to rear). Both wings will be exactly alike in size, construction, and arrangement of the rooms. The basement in each case will be about 12 feet high and mainly above ground, so that it may be used for laboratories and certain mechanical operations. The first and second stories will be 16 feet 3 inches, the third story 15 feet 7½ inches, and the fourth story 13 feet 9 inches in height, with a low air space above.

Corridors about 12 feet wide, running the entire length, will divide each wing in half, giving a series of communicating rooms on either side. These rooms will be units of about 20 by 22 feet in the clear, the windows and doors being so arranged that the rooms may be divided if desired by temporary partitions, making an office and a laboratory, or two office rooms, about 11 by 20 feet. The partitions dividing the rooms at right angles to the corridors will consist of two four-inch brick walls, 14 inches apart and tied together, thus providing a series of continuous open spaces extening from the subbasement to the attic. These hollow partitions will carry the hot-air flues and the flues for ventilation. Each room will have two hot-air flues, two ventilating outlets, and two flues for the ventilation of hoods. The room ventilation will be downward, the flues for each wing connecting in the subbasement with two vent passages leading to two vent shafts, each provided with a fan for discharging the air. The hoods will be ventilated by an up-draft, the flues terminating in the attic, which is left as one large room, and the fumes being drawn out of that by fans. The hot-air flues will be of galvanized iron and all the vent flues of terra cotta.

The subbasement will be given up entirely to the heating and ventilating system, and to conduits carrying the supply pipes. Heat will be supplied by indirect radiation, the steam being furnished by a power plant located in a special building already provided for. There will be no direct radiators except at the ends of the corridors and in the toilet rooms. The incoming air will pass through filters to remove the dust, and then through the primary heaters which will raise it to a tempera-

ture of about 75°, regardless of the outside temperature. The tempered air will be circulated by two fans and discharge into a large plenum chamber, from which tempered air passages will run to various parts of the building. In the plenum chamber the tempered air will be sprayed with moisture to give it the proper degree of humidity. Supplementary heaters, located under each tier of rooms, will heat a part of the air to 110°, and at the bottom of each pair of flues will be mixing dampers for controlling the amount of hot air mixed with the tempered air. These dampers will be actuated by thermostats located in the rooms above, so that the heat of each room will be absolutely under control and can be cut off independently of any other room.

Provision will be made for supplying each laboratory room with hot and cold water, distilled water, gas, live steam, compressed air, and suction, as well as with electricity for light and power. All pumps and machinery for maintaining the supplies of these will be located without the building in the power house. The equipment of the latter will include a plant for generating the electricty used for various purposes.

At six points in each wing there will be pipe shafts which will conduct the risers from the supply pipes in the subbasement, the laterals for each room being brought out horizontally and suspended from the ceiling of the room below, whence they will be brought up through the floor at the desired points. All piping will thus be exposed, and the pipe shafts will be provided with doors so that the risers will be easily accessible. In each of the double partitions between the rooms and next to the outside wall will be a lead-lined soil pipe to carry the waste.

The details of equipment for the various laboratories will be worked out later, after the assignment of the space has been made. Work tables, sinks, hoods, and other fittings will be installed to suit the requirements of the different kinds of work, but in the construction of the building there will be no special provisions for a chemical laboratory, a soil laboratory, a botanical laboratory, and the like, such as are usually made in buildings of this kind. The facilities provided throughout the two wings will be so complete as to admit of adapting the rooms to a great variety of purposes, and to allow changes or extension of quarters to be made readily at any time in future. This will avoid the tearing up of floors and special equipment, and will be a great advantage in an institution like the Department, whose work is growing rapidly and whose special needs are changing from time to time.

Each wing will have three elevators, one of which will probably be used for freight; and on each floor will be located three large toilets, suitably ventilated, and provided with open plumbing and marble fittings, together with janitors' storerooms.

The buildings will be either of marble or granite, with solid masonry walls, the floors being either of steel with fireproof construction between, or of reenforced concrete. The corridor floors will be of Terrazzo with marble borders, and the laboratories of concrete, maple floors being used in the offices. The walls and ceilings will be of cement plaster. The total floor space provided by each building is 80,000 square feet, including the corridors. This leaves about 55,000 square feet in each building available for office and laboratory rooms.

The construction of the building will be in charge of Captain John S. Sewell, of the War Department, as supervising engineer; R. Barnard Talcott, consulting mechanical engineer; and S. Franklin Gardner, mechanical engineer and superintendent.

The final plans and specifications are now being prepared, and it is expected that contracts will be let and the work of construction begun during the present summer.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

On the losses of sulphur in charring and in ashing plant substances; and on the accurate determination of sulphur in organic substances, W. E. Barlow (*Jour. Amer. Chem. Soc., 26 (1904), No. 4, pp. 341–367, figs. 3*).—This article gives details of studies of a large number of methods of incinerating organic substances carried out at Göttingen University under direction of Prof. B. Tollens. The general conclusions reached are as follows:

"(1) In ashing a plant substance, a protein or a coal in the ordinary manner, without addition of alkali, a loss of sulphur always takes place. This loss is always considerable, and may be, in some cases, enormous, even when precautions are taken to insure a low temperature and a slow and regular ashing. It is caused by the conversion of organic sulphur into volatile sulphur compounds and into sulphur dioxid and trioxid during the charring and ashing. A certain part of these is retained by the bases, especially by the alkalis, but in presence of phosphoric and silicic acids, which expel sulphuric acid at a red heat, the amount retained in the ash may be very small or even nothing.

"(2) The loss takes place even when there is a quantity of alkaline base present more than sufficient to combine all the acid.

"(3) The loss is diminished (but by no means entirely avoided) by the addition of amounts of sodium carbonate up to twice the weight of the substance to be ashed. The additional effect of adding more sodium carbonate is practically nothing.

"(4) The loss of sulphur is not entirely prevented either by the addition of calcium acetate before ashing (Tucker); or, of magnesium oxid and sodium carbonate together (Eschka); or by evaporation with potassium hydroxid followed by oxidation with potassium nitrate; or by evaporation with nitric acid and potassium nitrate before ashing (Fraps). In all these cases the gases still contain sulphur.

"(5) By far the greater part of the loss of sulphur occurs during the preliminary charring, a much smaller part during the burning of the charred mass to ash.

"(6) Combustion in a stream of oxygen, with absorption of the sulphur-containing products of charring and combustion either in heated sodium carbonate in the combustion tube or in a special apparatus, gives, under proper conditions, absolute values for the total sulphur. Such results are, however, exceedingly difficult, if not quite impossible, to attain by either the original Berthelot method or the Sauer method. The writer considers that he has ascertained and described the arrangement of apparatus and the details of manipulation which render possible the attainment of such accurate results with ease and certainty. It is essential to burn the escaping gases completely with an excess of oxygen, introduced laterally at a certain point in the combustion tube, before absorbing the sulphuric acid from them."

Investigations on the accurate determination of sulphur in plant substances and other organic materials, W. E. Barlow (*Inaug. Diss., Univ. Göttingen, 1903, pp. 87, figs. 3, dgm. 1; abs. by B. Tollens, in Jour. Landw., 51 (1903), No. 3,*

pp. 289–313, figs. 2).—This is the detailed report of investigations on the determination of sulphur in organic substances, the general results of which are noted above from another source.

Contributions from the agricultural chemical laboratory at Göttingen, B. TOLLENS (*Jour. Landw., 51* (*1903*), *No. 4, pp. 355–369*).—This is a brief summary of the numerous contributions from this laboratory which have appeared during the last 10 or 12 years.

Ash in feed stuffs, M. HAVENHILL (*Iowa Agr., 4* (*1904*), *No. 6, pp. 230–233*).—A compilation of analyses with a discussion of the function of the ash constituents in nutrition.

The precipitation of magnesium oxalate with calcium oxalate, N. KNIGHT (*Chem. News, 89* (*1904*), *No. 2313, pp. 146, 147*).—Analyses of dolomite rock by different students are reported, which show that the amount of magnesium oxalate which will be precipitated with calcium oxalate varies from an almost inappreciable amount to a considerable quantity. In the author's opinion "it is therefore always better to dissolve the unwashed precipitates of calcium and magnesium in warm hydrochloric acid, then to add ammonia to precipitate the calcium. After standing a suitable time, the calcium may be filtered, and the filtrate can be added to the solution containing the main portion of the magnesium, or the two portions can be separately treated."

A new method for the determination of free lime and on so-called "dead burnt" lime, E. H. KEISER and S. W. FORDER (*Amer. Chem. Jour., 31* (*1904*), *No. 2, pp. 153–162, fig. 1*).—The method proposed is carried out as follows:

Heat 0.2 to 0.5 gm. of the material in a platinum crucible to drive off moisture, or in case of cements, heat over a blast lamp for a few minutes to expel carbon dioxid, cool in a desiccator, and weigh. Add a few drops of recently boiled distilled water and place the crucible in a brass protector consisting of a cylindrical box provided with a screw top carrying a brass inlet and outlet tube, the thread of the cap being made air-tight with a little white lead and oil. Place the protector in an air bath and raise the temperature to 85° C., allowing it to remain at this point for 30 minutes. Draw a slow current of air freed from carbon dioxid and moisture through the apparatus and raise the temperature to 185° C., maintaining the temperature at this point for 30 minutes. Cool the crucible in a desiccator and weigh, the increase in weight giving the amount of water taken up by the quicklime to form calcium hydroxid.

Satisfactory tests of the method with different materials under a variety of conditions are reported.

A portable outfit for the determination of carbonic acid, dissolved oxygen, and alkalinity in drinking water, F. B. FORBES (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 4, pp. 382–388, figs. 3*).—Outfits for determination of dissolved oxygen by the Winkler method, free carbonic acid by Seyler's method, and alkalinity or fixed carbonic acid by Hehner's method are described.

Sprengel's method for colorimetric determination of nitrates, L. W. ANDREWS (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 4, pp. 388–391*).—This article briefly reports experiments in which it was shown that the yellow color obtained in Sprengel's method is not due to the formation of picric acid but to paranitrophenol.

The determination of nitrogen in food materials and physiological products, H. C. SHERMAN, C. B. McLAUGHLIN, and E. OSTERBERG (*Jour. Amer. Chem. Soc., 26* (*1904*), *No. 4, pp. 367–371*).—In tests with 17 animal and vegetable substances several modifications of the Kjeldahl method were compared as regards the time required for the complete transformation of the nitrogen.

When the sample was digested with sulphuric acid and mercury or with sulphuric acid and potassium sulphate, the transformation of the nitrogen was rarely complete when the solution became colorless or of a faint straw color. Continuing the diges-

tion for 2 hours longer gave higher results, the average difference being about 1 per cent of the amount of nitrogen present. When the sample was digested with both mercury and potassium sulphate slightly higher results were obtained and the time required for digestion was reduced, though it was still necessary to continue the boiling beyond the point at which the solution became colorless. The results were not appreciably affected by the addition of copper sulphate or potassium permanganate to the reagents mentioned.

The following procedure is recommended for the determination of nitrogen existing in the form of proteids and related compounds: "Treat the sample with 20 cc. of concentrated sulphuric acid and 0.7 to 1 gm. of mercury, heat gently until frothing subsides, and then add 10 to 15 gm. of potassium sulphate and boil. Usually the solution becomes colorless in less than 30 minutes, and the transformation of nitrogen into ammonium sulphate is complete within an hour." A further study with organic compounds of known structure is contemplated.

Method for the determination of proteids in plants, L. Beulaygue (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 11, pp. 701–703*).—The method described is believed to be more accurate and rapid than that of Stutzer and Hirschler.

The rapid determination of fat by means of carbon tetrachlorid, A. P. Bryant (*Jour. Amer. Chem. Soc., 26 (1904), No. 5, pp. 568–573, fig. 1*).—A comparison of carbon tetrachlorid with more common reagents for the extraction of fat led the author to the conclusion that the tetrachlorid is very satisfactory for this purpose, especially in the commercial analysis of foods and feeding stuffs. It was found very rapid in its action, "two hours apparently sufficing for complete extraction in all cases. It is uninflammable, thus reducing the danger of explosion and fire to a minimum, [and] it is inexpensive."

From the figures showing the results of comparative tests the following are quoted: In four of the samples of vegetable origin the amount of ether extract was 0.12, 0.14, 0.17, and 4.05 per cent, respectively, the carbon tetrachlorid extract in corresponding samples being 0.12, 0.15, 0.17, and 4.06 per cent, respectively. Practically as close agreement was found in the case of other samples. As compared with carbon bisulphid, the carbon tetrachlorid extract in several samples of vegetable origin was 10.7, 11, and 11 per cent, respectively, and the carbon bisulphid extract was 10.1, 10.8, and 10.7 per cent, respectively. In the case of air-dried pork the amount of ether extract was 71.3 per cent and the carbon tetrachlorid extract 72.6 per cent.

In extracting fat with carbon tetrachlorid the Knorr extraction apparatus was used, the flasks being heated on a water bath with live steam and protected with copper shields in the form of half cones, in order to prevent condensation of the carbon tetrachlorid in the lower part of the apparatus.

Observations on the composition of potato starch, A. Fernbach (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 7, pp. 428–430*).

Concerning the acid content of different sorts of flour and other analytical data, A. Fachinato (*Gaz. Chim. Ital., 33 (1903), II, pp. 543–555; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 299*).—In the author's opinion, the estimation of the acid present in an alcoholic extract of flour is especially useful as a means of judging of its quality. Phenolphthalein is used as an indicator.

Note on the hydrolysis of edestin, E. Abderhalden (*Ztschr. Physiol. Chem., 40 (1903), No. 3–4, pp. 249, 250*).—A note supplementing the investigation previously reported (E. S. R., 14, p. 1044).

The examination of meat, yeast, and other extracts for xanthin bodies. II, The xanthin bodies of yeast extracts, K. Micko (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 257–270*).—Analytical methods are described and results reported.

The oxidation of gelatin with permanganates, G. Zickgraf (*Ztschr. Physiol. Chem., 41 (1904), No. 3, pp. 259–272*).—Oxidizing gelatin with different permanga-

nates, the author obtained varying amounts of guanidin picrate. When calcium permanganate was used another oxidation product was also obtained, the chemical characteristics of which are briefly described.

Salmon oil, B. DE GREIFF (*Chem. Rev. Fett u. Harz-Ind., 10 (1903), p. 223; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 7, p. 418*).—Analytical data are reported regarding salmon oil, which is manufactured in large quantities in British Columbia.

Studies on the odor of sprat oil and cod-liver oil, L. SERVAIS (*Chem. Rev. Fett u. Harz-Ind., 10 (1903), p. 231; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 7, pp. 418, 419*).—Chemical studies are briefly reported.

The detection of artificial coloring matters in foods and condiments, E. SPAETH (*Pharm. Centralhalle, 44 (1903), pp. 117, 118; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 310*).—The use of sodium salicylate for the extraction of artificial coloring matter from jams, flour preparations, etc., is recommended.

Short text-book of food chemistry, RÖTTGER (*Kurzes Lehrbuch der Nahrungsmittelchemie. Leipzig: J. A. Barth, 1903, 2. ed., pp. 698; rev. in Hyg. Rundschau, 14 (1904), No. 6, p. 283*).—A new edition of this text-book.

Progress in the chemistry of the fermentation industries during the last three years, O. MOHR (*Ztschr. Angew. Chem., 17 (1904), Nos. 1, pp. 10–17; 2, pp. 49–51*).—A review.

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1903 (*U. S. Dept. Agr., Bureau of Chemistry Circ. 13, pp. 14*).—This is an advance circular giving the recommendations of referees as adopted, and the motions and appointments affecting the work of 1904.

BOTANY.

The development and structure of vegetation, F. E. CLEMENTS (*Lincoln: Univ. Nebraska, Bot. Survey, 1904, No. 7, pp. 175*).—This constitutes an enunciation of the principles on phologeny and structure of vegetation, which have been the basis of the author's investigations covering a period of about 6 years. The principles were first given as hypotheses in 1898, and have been subject to constant test in the field since that time, the present publication giving the author's conclusions relating to plant ecology.

The principal portion of the work deals with the physical factors of the prairie formation in Nebraska. The principles of association, invasion, and zonation are discussed at length, and an attempt is made to systematically consider them in considerable detail as well as to introduce the principles of succession and alternation as factors in plant life. The author states that the various hypotheses have been repeatedly confirmed, and they are now presented as a working basis for those interested in similar lines of investigation.

The different factors discussed are association; invasion, which includes migration and what the author terms "ecesis," or the phenomena exhibited by the organism from the time of its introduction until it becomes thoroughly established in a formation; succession, zonation, and alternation. These are treated historically, after which the phenomena are discussed; and each chapter concludes with numerous references to the literature of the subject.

Nitrogen bacteria and legumes, C. G. HOPKINS (*Illinois Sta. Bul. 94, pp. 307–328, figs. 5*).—A description is given of the action of bacteria in the preparation of plant food for assimilation by the plant and the function of the nitrogen-gathering bacteria. The results of a number of investigations with red clover, cowpeas, soy beans, alfalfa, and sweet-clover bacteria are given. In many instances where failures have followed the attempt to secure a good growth of these plants, soil inoculation

has proved of great benefit. After a small portion of soil has been introduced and the plants develop tubers upon their roots, there seems to be a rather rapid spread of the organisms throughout the soil. For the growth of the different crops, applications of soil at the rate of from 200 lbs. to a ton per acre is recommended where the cost would not be too great. Smaller applications would hardly be expected to give a marked effect on the yield the first season, although the effect might be sufficient to secure a good growth during subsequent years.

A report is given of the effect of bacteria on the development of cowpeas, in which the dry matter and nitrogen content of the tops, roots, and tubercles of 10 average plants, grown with and without bacteria, were compared from 3 series of plants. In each case a decided increase in the amount of nitrogen was noted where bacteria were present. The experiments with alfalfa and sweet clover have shown that bacteria from sweet clover tubercles are very efficient as a source for the inoculation of alfalfa soils.

The author states that while some Illinois soils are becoming deficient in phosphorus and lime, ground limestone may be applied to such soils with marked benefit and profit, especially for the growing of legumes; but there is abundant evidence that one of the dominant causes of unsatisfactory growth is absence of the proper nitrogen-gathering bacteria. It is believed that the bacteria will not live indefinitely in the soils without the intervention of leguminous crops, but further investigation is needed to establish this fact.

Three edible toadstools, J. C. Arthur (*Indiana Sta. Bul. 98, pp. 45–50, pls. 7*).—The author describes *Coprinus micaceus*, *C. atramentarius*, and *C. comatus*, and gives suggestions for their collection and preparation for the table.

On the growth of higher plants in the presence of a mixture of algæ and bacteria, R. Bouilhac and E. Giustiniani (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 5, pp. 293–296*).—An account is given of experiments with buckwheat, white mustard, maize, and cresses, the results of which confirm those obtained in experiments previously reported (E. S. R., 15, p. 753), and show that nonleguminous plants are capable of utilizing the atmospheric nitrogen which is fixed by algæ and bacteria, the nitrogenous matter being produced by the micro-organisms with sufficient rapidity to permit rapid development of the higher plants.

METEOROLOGY—CLIMATOLOGY.

Meteorological observations, C. D. Woods (*Maine Sta. Bul. 99, pp. 210–212*).—A summary of monthly averages of observations at Orono, Me., during 1903, on atmospheric pressure, precipitation, cloudiness, and wind movement, with means for temperature and precipitation for 35 years, and monthly and annual precipitation for the same year at 20 different places in Maine. The annual summary for Orono is as follows: Pressure 29.81 in., temperature 42.83° F. (mean for 35 years 42.3), precipitation 37.61 in. (mean for 35 years 44.57 in.), snowfall 64.9 in. (average for 35 years 92.1).

Meteorological observations, J. E. Ostrander and F. F. Henshaw (*Massachusetts Sta. Met. Buls. 181, 182, 183, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January, February, and March, 1904. The data are briefly discussed in general notes on the weather of each month.

Meteorological summary for 1902, C. A. Patton (*Ohio Sta. Bul. 143, pp. 131–143*).—This summary includes notes on the weather and tabulated daily and monthly records of observations at the station at Wooster, Ohio, on temperature, precipitation, cloudiness, direction of the wind, etc., and for comparison, similar

data for previous years and for other parts of the State. The following is a summary of results:

Summary of meteorological observations in Ohio.

	For the experiment station.		For the State.	
	1902.	1888–1902.	1902.	1883–1902.
Temperature (° F.):				
Mean	49.5	49.2	50.6	50.8
Highest	(May 4) 97.0	(Aug. 8, 1891) 99.0	(July 8) 100.0	(July 4, 1897) 113.0
Lowest	(Feb. 5) − 9.0	(Feb. 10, 1899) −21.0	(Feb. 14) −17.0	(Feb. 10, 1899) −39.0
Mean daily range	21.3	20.6	...	...
Greatest daily range	(May 4) 45.0	(Oct. 6, 1895) 55.0	(May 4) 56.0	(Sept. 28, 1897) 67.0
Clear days	183.0	129.0	...	...
Cloudy days	133.0	122.0	...	...
Days rain fell	140.0	128.0	114.0	121.0
Rainfall (in.):				
Greatest monthly	(June) 5.55	(July, 1896) 8.05	...	...
Least monthly	(Jan.) .63	(Sept., 1897) .29	...	...
Mean yearly	...	...	37.58	37.13
Prevailing direction of wind.	SW.	SW.	SW.	SW.

Meteorological chart of the Great Lakes, A. J. HENRY and N. B. CONGER (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1903, No. 2, pp. 17, chart 1*).—This is the usual summary of observations for the season of 1903 on storms, atmospheric precipitation and lake levels, open and closing of navigation, wrecks and casualties, etc.

Rainfall at variety experiment stations, Barbados (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1901–1903, pp. 75, 76*).—Monthly rainfall (December, 1901, to May, 1903) at 10 different stations is reported.

Composition of Barbados rainfall (*Rpt. Agr. Work, Imp. Dept. Agr. West Indies, 1901–1903, p. 3*).—The monthly rainfall (December, 1901, to May, 1903) and the content of chlorin and nitrogen (ammonia and nitrates) are reported.

The weather during the agricultural year 1902–3, F. J. BRODIE (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 410–419*).—A general discussion with tabulated data on the weather conditions of Great Britain during the period.

The Philippine Islands and their people, H. GANNETT (*Nat. Geogr. Mag., 15 (1904), No. 3, pp. 91–112, figs. 13*).—Contains a section on the climate of the islands.

Simultaneous solar and terrestrial changes, J. N. LOCKYER (*Nature [London], 69 (1904), No. 1789, pp. 351–357; abs. in Science, n. ser., 19 (1904), No. 483, p. 556*).

AIR—WATER—SOILS.

On the presence of formaldehyde in the atmosphere, H. HENRIET (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 4, pp. 203–205*).—Observations at Montsouris observatory covering a period of one year, 1903, showed the presence in the air of 1 to 5 parts of formaldehyde to 100,000 parts by weight of air.

Potable waters in southwest Lancashire, J. C. BROWN (*Chem. News, 89 (1904), No. 2301, pp. 6–9*).—Detailed studies of a number of surface, deep-well, and shallow-well or spring waters are reported.

Soil treatment for peaty swamp lands, including reference to sand and "alkali" soils, C. G. HOPKINS (*Illinois Sta. Bul. 93, pp. 273–303, figs. 5*).—This bulletin summarizes the information regarding these lands which has been secured in connection with the general survey made by the station of Illinois soils, as well as the results of experiments made on a number of typical areas. It is shown that there are many thousand acres of peaty swamp land in northern and north central Illinois, much of which produces almost no crops on account of a deficiency of pot-

ash. Some of these soils after years of cultivation are found to be deficient in nitrogen, which can be most economically supplied by means of leguminous crops.

"Certain kinds of farm manure produce fairly good results on some peaty swamp soils, but commonly it is better farm practice to use the manure on other kinds of soil and buy potassium for the peaty swamp soils. . . . While heavy applications of potassium must sometimes be made at first, with proper management only light applications will be required after a few years. . . . The so-called 'alkali' soils of Illinois, which are also being investigated, are not the same as peaty swamp soils."

Treatment and utilization of flood-damaged lands, A. M. Ten Eyck, H. F. Roberts, and A. Dickens (*Kansas Sta. Bul. 121, pp. 133-162, figs. 16*).—A general description is given of the effects of the flood which lasted from May 28 to June 5, 1903. In addition to the direct loss of farm products and buildings, great damage was suffered in the washing away of fertile soils and covering of cultivated fields with sand to depths varying from a few inches to several feet. Some areas were covered with comparatively infertile mud and other areas were badly damaged by being so water soaked that elaborate systems of drainage became necessary.

General recommendations are made regarding the treatment of washed and buried lands so as to restore their fertility as far as possible. The greatest amount of washing naturally occurred on cultivated lands, while lands covered with alfalfa were little affected. Recommendations are also made regarding the use of sand-binding grasses for areas covered with sand. Under similar conditions comparatively quick returns may be obtained on planting trees suitable for post production. For this purpose catalpa, black locust, Osage orange, Carolina poplar, etc., were recommended.

On the distribution of potash in cultivated soil, J. Dumont (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 4, pp. 215-217*).—The results of determinations of potash in the particles of different degrees of fineness in two soils are reported. These show that in one soil five-sixths of the total potash occurred in the fine particles, the clay itself containing one-fifth. In the other soil seven-tenths of the potash was found in the coarser sand, the finer particles, and especially the clay, containing only a very small proportion. The bearing of these facts on the assimilability of the potash of the soil is briefly discussed.

Analyses of soils of São Paulo, G. d'Utra (*Bol. Agr. São Paulo, 4. ser., 1903, No. 12, pp. 551-557*).—Chemical analyses of 91 samples are reported.

FERTILIZERS.

The preservation of hen manure, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 98, pp. 199-204*).—A compilation of analyses of hen manure is given, with results of tests of the efficiency of various preservative materials, including kainit, plaster (gypsum), acid phosphate, and sawdust. Both kainit and acid phosphate prevented practically all loss of nitrogen. The gypsum was somewhat less efficient. The use of sawdust materially improved the mechanical condition of the manure. The management and value of hen manure as a fertilizer are briefly discussed.

Barnyard manure, W. H. Beal (*U. S. Dept. Agr., Farmers' Bul. 192, pp. 32, figs. 4*).—A revision of Farmers' Bulletin 21 (E. S. R., 6, p. 521).

Fertilizers, A. M. Muckenfuss (*Arkansas Sta. Bul. 81, pp. 83-96*).—This bulletin reports analyses of fertilizers registered in Arkansas during 1904, with some general notes on the use of fertilizers.

Analyses of commercial fertilizers, M. A. Scovell et al. (*Kentucky Sta. Bul. 112, pp. 227-264*).—Results of analyses of 161 samples of fertilizers are reported. Of these, 27 samples, "representing 24 brands and 15 firms, fell so far below the guaranteed analyses in phosphoric acid, nitrogen, or potash, or any two or all three of these ingredients, that this could not be accounted for by variations in sampling or analysis."

Licensed commercial fertilizers, F. W. Woll (*Wisconsin Sta. Bul. 109, pp. 5, 9, 10*).—Analyses of 17 samples of fertilizers are reported, with the text of the State fertilizer law.

Special investigations on phosphates and the causes which modify their assimilability, C. Schreiber (*Recherches spéciales sur les phosphates et les causes qui modifient leur absorbabilité. Maeseyck: Vanderdonck-Robyns, 1903, pp. 35, fig. 1*).—Investigations extending over a series of years are reported which show that Thomas slag and mineral phosphates are more effective as fertilizers on acid peaty soils than superphosphates. Slag gives better results than precipitated phosphate, especially on sandy soils, and liming reduces the action of mineral phosphates but increases the assimilability of the phosphoric acid of humus soils.

On the rôle of phosphorus in mineral deposits, L. De Launay (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 5, pp. 308–310*).

The saline deposits of California, G. E. Bailey (*California State Min. Bureau Bul. 24, pp. 216, figs. 98, maps 5*).—This is a report of a geological reconnaissance of the southeastern portion of California, and deals with the general climatic and geologic conditions of the Great Basin, the deposits of borates, carbonates, chlorids, and nitrates of the region, with a list of elevations, a bibliography, and an account of the California State Mining Bureau.

The portion of this report relating to nitrates is of special agricultural interest. The similarity of the California nitrate beds to the Chilean deposits is pointed out. The history, location, quality, and extent of the California deposits are discussed. It is stated that nearly all the niter beds so far discovered are situated in the northern part of San Bernardino County, extending across the boundary line into the southern part of Inyo County. "They are found along the shore lines, or old beaches, that mark the boundary of Death Valley as it was during the Eocene times." Chemical analyses are reported which show percentages of niter varying from 7.28 to 61.2 associated with varying quantities of sodium chlorid, sodium sulphate, calcium sulphate, magnesium sulphate, and iodin compounds.

While it is not possible to estimate with any degree of accuracy the extent and value of these deposits, "the facts so far as obtained show the existence of quantities on a scale large enough to be of national interest. The analyses show that niter exists in some of the claims rich enough to rival the beds of Chile."

The Chilean nitrate trade (*Engineer. and Min. Jour., 77 (1904), No. 13, p. 510*).—The total export during 1903 is reported at 31,683,294 quintals (1,606,343.01 tons). Of this amount the United States consumed 5,914,275 quintals (299,853.74 tons).

The most profitable agriculture with the cheapest manuring, H. Droop (*Neue Bahnen in der Landwirthschaft, vol. 3. Lohnendster Ackerbau bei billigster Düngung. Heidelberg: Moriell, 1903, pp. IX+228, figs. 9*).

FIELD CROPS.

Alfalfa in Alabama, J. F. Duggar (*Alabama College Sta. Bul. 127, pp. 47, figs. 2*).—This bulletin discusses alfalfa culture in Alabama, describes the results of experiments made at the station, and presents the experience of a number of alfalfa growers in different parts of the State. Special mention is made of the Alabama soils adapted to the culture of this crop, and several methods of soil inoculation are outlined.

Estimates from different farmers indicate that usually after the first season 4 cuttings of alfalfa can be made, and that on good land a total of from 3 to 6 tons of hay per acre may be obtained. The first cutting is usually made about the first of May, and sometimes even earlier.

The author believes that from the data at hand well-drained black bottoms and drained alluvial lime bottoms with a little sand may be regarded as first class; black,

shelly gray, or rich chocolate uplands as second class; and poor, stiff red or post-oak land and poor gray to white prairie, as third-class alfalfa lands.

Tabulated results of fertilizer experiments made at the station show that 80 lbs. of nitrate of soda per acre, applied with the seed in the spring, was ineffective, while 6 tons of stable manure per acre, applied in February to fall-sown alfalfa, more than doubled the yield. In general spring and fall sown plats yielded at the rate of about 1 ton of hay per acre the first summer. A plat receiving 18 tons of stable manure per acre yielded 3.4 tons of hay per acre the third season after the application; and a plat given 20 bbls. of lime per acre, at the time the manure was applied to the other plat, gave practically the same yield. Large quantities of lime and manure applied together did not give an increase the third year after application as compared with either used alone. A plat of sandy soil of fair quality inoculated with earth from an old alfalfa field and treated with 1,000 lbs. of slaked lime per acre, gave a total yield for the season of 2,266 lbs. of hay per acre as compared with practically nothing on the check plats.

The general failure on all these plats was due to winterkilling. An adjacent plat sown with crimson clover at the time the alfalfa was sown yielded 6,100 lbs. of hay per acre, and produced that same season 13,000 lbs. of sorghum hay per acre. From cooperative experiments it is learned that on prairie lands an application of 200 lbs. of cotton-seed meal, 240 lbs. of acid phosphate, with 200 or 100 lbs. of kainit per acre has given good results with alfalfa. The use of stable manure also produced good yields.

Plants taken in April from plats sown the preceding October showed a large supply of tubercles on inoculated and limed soil, and an absence of tubercles on soil neither limed nor inoculated. It has been found that earth from melilotus or bur clover fields will serve to inoculate the soil for alfalfa.

From observations made during 8 years the author concludes that in central Alabama fall sowing of alfalfa should be done from September 15 to October 15, and spring sowing from March 1 to 20. Broadcasting 20 lbs. of seed per acre has in general given the best results at the station when the crop was grown for hay. When used for green feed small areas may be profitably drilled and cultivated. In some of the tests crab grass increased rapidly on the alfalfa plats from one cutting to another.

Directions for the breeding of corn, L. H. SMITH (*Illinois Sta. Circ. 74, pp. 10*).—This circular briefly describes the methods followed and recommended by the Illinois Station for the improvement of corn by systematic selection and breeding. This matter has been presented at greater length in previous publications of the station (E. S. R., 14, p. 855; 15, p. 352).

Kherson oats, T. L. LYON (*Nebraska Sta. Bul. 82, pp. 8*).—This Russian variety is described as being well suited to central and western Nebraska on account of its habits of growth. Results obtained at the station and by farmers throughout the State are reported. In 1900 this variety yielded at the rate of 52.6 bu. per acre on about 2 acres of land, standing first among a number of varieties grown in comparison. In 1902 it yielded 41.7 bu. per acre, being followed by Texas Red, and Sixty Day, another Russian variety, with yields of 33 and 29.6 bu. per acre, respectively. The varieties were all sown March 26, but the two Russian sorts were ripe July 5, while the Texas Red did not mature until July 16.

The result of a variety test conducted in 1903 places the Kherson oats at the head of the list, with a yield of 68 bu. per acre, followed by Texas Red, Canada Red, and Sixty Day with 57.5, 53.1, and 52.4 bu. per acre, respectively. The yields obtained in the cooperative tests which have been in progress for 3 years are given in a table.

Work of the experiment station and laboratories of the Hawaiian Sugar Planters' Association, C. F. ECKART (*Hawaiian [Sugar Planters'] Sta. Rpt. 1903, pp. 1-74, dgms. 2*).—This report includes further results of previously described work (E. S. R., 14, p. 565). As in former years Lahaina and Rose Bamboo cane were grown

in connection with these experiments. The yields obtained with different amounts of irrigation water is shown in the following table:

Volume of irrigation water in its relation to the yield of cane.

Irrigation.	Cane per acre, 1903.		Average weight of cane.		Average of 1901 and 1903.
	Lahaina.	Rose Bamboo.	1901.	1903.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
One inch per week	146,362	118,425	308,805	132,393	220,599
Two inches per week	152,866	130,157	390,080	141,511	265,795
Three inches per week	160,882	136,778	285,343	148,830	217,086
Two inches every two weeks	141,773	121,349	328,657	131,561	230,109
Three inches every three weeks	115,579	118,077	226,170	116,828	171,499

Irrigation was discontinued when the rains were sufficient, and the volume of irrigation water as given in the table simply means the maximum quantity applied for the given period of time. Data with reference to soil moisture show that the plat receiving 1 in. of irrigation water per week contained on an average 30.84 per cent of water at 1 ft. in depth after irrigation, and 23.87 per cent before the next irrigation. The corresponding figures for the plats receiving 2 in. per week, 3 in. per week, and 3 in. in 3 weeks were 30.62 and 26.83, 35.90 and 31.81, and 32.74 and 16.73 per cent, respectively. The highest percentage of moisture, 31.38 per cent, was maintained in the plat irrigated at the rate of 3 in. per week, and the lowest, 27.43 per cent, in the plat irrigated at the rate of 3 in. in 3 weeks. In 1901 the plat receiving 2 in. per week produced the largest yield, while in 1903 the plat receiving 3 in. per week gave the best yield, but the total quantity of water received by the two plats was very much the same. Lahaina cane gave the best results with 3 in. of water per week and Rose Bamboo with 2 in. A series of tables is given showing analytical results, together with the quantities of water used per acre and per pound of sugar produced. Some of the data, being the averages for the 2 varieties, are shown in the following table:

Quantity of water in its relation to the production of sugar and solid matter.

Irrigation.	Water used per acre.	Sugar produced per acre.	Water per lb. of sugar.	Water per lb. of solid matter.
	Gallons.	*Pounds.*	*Gallons.*	*Gallons.*
One inch per week	3,571,022	21,911	163.9	39.9
Two inches per week	5,118,800	22,889	223.6	58.2
Three inches per week	6,666,578	23,992	277.8	71.0
Two inches every two weeks	3,652,484	22,258	164.1	41.0
Three inches every three weeks	3,733,946	19,184	194.6	46.5

Three inches of water per week furnished 57 in. of water more to the crop than 2 in. per week, and the difference in yield of sugar amounted to 1,103 lbs. This is equivalent to a requirement of 1,403 gal. of water for every additional pound of sugar produced under the heavier irrigation. A comparison of the results with 3 in. and 1 in. of water per week shows that 1,487 gal. were required per pound of increase. The author states that while the larger volumes of water gave an increase in sugar in these experiments, such increase would, under some conditions, be obtained at a loss.

The water-absorptive power of the station soil is given as 40.74 per cent, and at a depth of 1 ft. the soil on the 3 in. per week plat contained on an average 77 per cent of the water it could hold. The average results of 18 irrigations show that at 1 ft. in depth the soil contained 25.65 per cent of moisture before and 28.61 per

cent after irrigating. For 2 ft. in depth the corresponding figures were 29.67 and 31.99 per cent, and for 3 ft., 33.61 and 34.86 per cent, respectively.

Data obtained in experiments on saline irrigation are given, and some of the results are presented in the following table:

Irrigation experiments with salt water.

Salt per gallon.	Salt added per acre.	Cane per acre.	Purity of juice.	Sucrose in cane.	Sugar per acre.
Grains.	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Pounds.*
50	14,159	135,675	91.46	16.2	21,979
100	28,318	92,754	91.18	16.38	15,193
150	42,477	102,744	89.99	15.22	16,638
200	56,636	79,860	90.42	14.63	11,684

These results indicate that excessive quantities of salt in irrigation water reduce the yield and lessen the availability. The juices showed a material, though disproportionate, increase in chlorin as the salt was increased.

In the stripping experiments reported, one plat was stripped in June, 1901, one in March and October, 1902, and another in March, August, and November, 1902. The results are summarized in the following table:

Results of stripping experiments.

Number of strippings.	Cane per acre.	Sucrose in cane.	Sugar per acre.	Density (Brix).	Sucrose in juice.	Glucose in juice.	Purity.
	Pounds.	*Per cent.*	*Pounds.*	°	*Per cent.*	*Per cent.*	*Per ct.*
None	150,950	17.14	25,873	20.62	19.15	0.311	92.87
1	156,467	17.00	26,599	20.78	19.00	.258	91.43
2	142,586	17.45	24,881	21.18	19.50	.241	92.06
3	140,031	16.24	22,741	19.82	18.15	.369	91.57

These results, however, are not as yet considered conclusive or generally applicable and the experiments will be continued.

A preliminary report on 21 varieties of cane shows a wide divergence in quality and yield. The density of the juice varied from 20.47 to 14.20° Brix, the sucrose from 19.15 to 11.3 per cent, the glucose from 1.58 to 0.169 per cent, and the purity from 93.32 to 79.57. In productiveness, Demarara No. 117 headed the list with a yield of 333,670 lbs. of cane and 43,010 lbs. of sugar per acre; and Badilla, a New Guinea variety, stood last with a yield of 43,560 lbs. of cane and 7,466 lbs. of sugar. Bud variation in Big Ribbon cane is used for the production of new varieties, but the results in their present state are as yet inconclusive. The character of cane from seed cane of normal Big Ribbon and several of its sports is briefly described.

The results with fertilizer experiments in which the essential plant food elements are furnished in different combinations at the rate of 100 lbs. per acre are reported in exhaustive tables. These experiments are as yet incomplete, and no conclusions have been reached.

In a second fertilizer experiment, begun in June, 1901, nitrogen, phosphoric acid, and potash were each applied at the rate of 150 lbs. per acre. The test was made with Lahaina and Rose Bamboo cane harvested in April, 1903. Both varieties produced the most cane from nitrogen and phosphoric acid with potash omitted. This plat also gave the highest yield of sugar with Lahaina, while with Rose Bamboo the plat receiving the three elements owing to a superior quality of juice gave the best yield. Lahaina responded better to high fertilization than Rose Bamboo, the greatest gain in sugar with Lahaina being 6,053 lbs. and with Rose Bamboo only 900 lbs. The gains from fertilization in the solid matter of the cane ranged from 3,367 to 12,488 lbs. with Lahaina and from 678 to 1,973 lbs. with Rose Bamboo. The gain

in the solid matter of the leaves with Lahaina ranged from 11,452 to 13,528 lbs. and with Rose Bamboo from 6,324 to 12,521 lbs. The fertilization stimulated leaf growth in Rose Bamboo and in the case of its greatest gain in total solid matter, 14,494 lbs., 86 per cent was in the leaves, while the corresponding gain with Lahaina was 25,614 lbs., of which only 51 per cent was in the leaves.

Experiments in fertilization with 200 lbs. each of nitrogen, phosphoric acid, and potash in various combinations were made simultaneously with the experiments just described. These tests, made in duplicate, occupied 12 plats, 2 of which received no fertilizer. The largest gain with both varieties was made where the 3 elements were applied in the form of ground bone, nitrate of soda, and sulphate of potash. The average gain for the 2 varieties was 3,360 lbs. of sugar. In the experiments with 100 lbs. of each element, applied in the forms of nitrate of soda, double superphosphate and sulphate of potash, the average gain for the 2 varieties was 4,289 lbs. of sugar. The loss due to heavy fertilization was in some instances very material.

A report on fertilization containing data to which reference has been made in the experiments above noted is reproduced. This deals largely with statistics concerning the use of fertilizers in Hawaii and the value and the application of the results obtained at the station.

The sugar cane in Egypt, W. TIEMANN (*Altrincham, England: International Sugar Journal, 1903, pp. XI+74, pls. 16, figs. 9*).—This deals with general cultivation, the sugar content of the cane, tillage of the soil, manuring mediums, manuring of the sugar cane, the arrangement of field experiments, field experiments during 1897–1900.

The complete story of Vineland sweets (*Amer. Agr., 73 (1904), No. 13, pp. 367, 370, figs. 2*).—An account of methods observed in the culture of sweet potatoes at Vineland, N. J. In fertilizing this crop a formula is used which calls for about 3 per cent of ammonia, 8 per cent of phosphoric acid, and 10 per cent of potash, and costs from $28 to $30 a ton. The cost of fertilizing an acre is about $20. The fertilizer is scattered directly in the furrows and the rows ridged over it.

Wheat growing on the Laramie Plains, B. C. BUFFUM (*Wyoming Sta. Bul. 60, pp. 39, pls. 7*).—A description of the Laramie Plains is given, and culture and variety tests with wheat at Laramie are reviewed. During the several years the work has been in progress (E. S. R., 11, p. 547), over 500 varieties representing different types and species have been grown. In 1902 a field of spelt yielded 2,907 lbs. per acre, amounting to 48.5 bu. at 60 lbs. per bushel, but the weight per measured bushel is much lower. Polish wheat (*Triticum polonicum*) has given an average yield of 23.6 bu. per acre on the station farm; macaroni wheat (*T. durum*) produced 19.2 bu. per acre in 1902, and one variety, Kubanka, yielded at the rate of 31.3 bu. per acre. Of Egyptian wheat (*T. compositum*), the Sevenhead variety yielded 28.6 bu. per acre in a field trial. This species produced only ordinary yields and did not prove more prolific than other types of wheat. These, together with a list of varieties of common wheat (*T. vulgare*), have been successfully grown at an elevation of over 7,000 ft. Each species of wheat is briefly described.

Of more than 150 varieties of winter wheat none was found sufficiently hardy for the locality. Winter rye has been successfully grown. Attention is called to the importance of early varieties, and those which ripen later than the first week in September are not recommended. The earliest and best yielding varieties for a number of years are enumerated. Of 300 varieties in 1903, 60 were ripe before September 1. From all the trials made the author makes the following selection of varieties which he deems recommendable: *Smooth wheats*—White Russian, Velvet Chaff, Scotch Fife, Saskatchewan, Nox, Jacinth, Sonora, Australian Club, Chili, Niagara, Amethyst, and Defiance; *Bearded wheats*—Pride of America, Doty, Soft Australian, Champion, Moscow, and Bearded Onyx.

The adaptability of wheats to the conditions which obtain in the locality, by means of improvement through breeding and selection, is discussed. Quite com-

plete directions for the culture of wheat on the Laramie Plains and other plateau lands are given.

The manuring of grass lands, A. D. HALL (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 76–109, figs. 4*).—English experiments which have been made in recent years on the possibility of improving pasturage by different systems of manuring are summarized and discussed. Of the general conclusions, the following are of special interest:

"It is better to lay up the same land for hay each year, grazing the aftermath only, and, in the same way, always to graze other land rather than graze and hay in alternate years. In this way we obtain the fullest development of those grasses and clovers which are suited to haying and grazing, respectively. For the same reason the system of manuring once adopted should be varied as little as possible, for even manures as similar as nitrate of soda and sulphate of ammonia encourage different kinds of grass.

"On poor land any large expenditure on manures will be wasted; the character of the herbage must be slowly re-formed; a full manuring is only utilized when there are plenty of strong and vigorous grasses or clovers among the vegetation."

The estate of Quednau, an example of modern methods of cultivation, A. BACKHAUS (*Das Versuchsgut Quednau, ein Beispiel der Angewandten Modernen Betriebslehre. Berlin: Paul Parey, 1903, pp. 270, figs. 44*).—In this volume an account is presented of the opportunities offered on large agricultural estates for testing and applying modern methods of culture. Historical notes are given on the estate of Quednau. A detailed description is presented of the plan upon which the estate is laid out and of various experiments which have been organized and carried out, especially on the subjects of fertilizers, cultivation of cereals, grasses, and roots, feeding animals, electro-culture, and the control of weeds and fungus diseases.

HORTICULTURE.

Experiment on the manuring of cabbages (*County Council Northumberland, Education Com., Rpt. 1903, p. 102*).—Experiments in manuring cabbages were made on soil of medium loam from 15 to 18 in. deep. The field had not been manured previously for 40 years. The largest number of salable heads was secured on the plat fertilized with 30 tons of barnyard manure, 225 lbs. of sulphate of ammonia, 650 lbs. of basic slag, and 175 lbs. of muriate of potash. Fully as good results were obtained when 300 lbs. of nitrate of soda was used in place of the 225 lbs. of sulphate of ammonia. The increased yields obtained when these fertilizers were used were 10 tons greater than when 30 tons per acre of barnyard manure was used alone.

Experiment on the manuring of carrots (*County Council Northumberland, Education Com., Rpt. 1903, p. 103*).—The carrots were grown in rows 17 in. apart. The soil was so poor that heavy applications of manure were necessary. The best results were secured from the use of 30 tons of barnyard manure combined with 350 lbs. of slag, 110 lbs. of sulphate of ammonia, and 175 lbs. of muriate of potash. The yield in this case was about 25 per cent greater than where barnyard manure alone was used.

Burbank's new rhubarb (*California Fruit Grower, 29 (1904), No. 822, p. 1*).—A letter is quoted from Luther Burbank in which the characteristics of his recently produced variety of rhubarb are given. This variety produces edible stalks throughout the year. Instead of the strongly acid taste of the older varieties it has a fruity flavor resembling that of the strawberry or raspberry. The plant has not yet been sufficiently multiplied to permit of its introduction to the public.

Iron absorption by spinach; manuring with iron salts, O. VON CZADEK (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 2, pp. 65–67*).—An experiment was made to determine whether the iron content of plants could be increased by fertiliz-

ing them with iron salts. Three pots were filled with 11.5 kg. each of earth. One pot received in addition 0.5 per cent of iron hydrate and another 2 per cent of iron hydrate. The third pot was used as a control.

Spinach was grown in each pot. That in the pot containing 2 per cent of iron hydrate made a poor growth as compared with that in the other pots. The plants in all 3 pots were analyzed with reference to the amount of iron in the dry substance. Spinach grown in the control pot contained 0.03 per cent of iron; in the pot fertilized with 0.5 per cent of iron hydrate 0.18 per cent of iron, and in the pot fertilized with 2 per cent of iron hydrate 0.23 per cent of iron. It is thus seen that in both cases where iron salts were used the amount of iron in the plant was increased, although in the latter case the amount of iron used was excessive and injured the growth of the plants.

The results indicate that the iron content of certain plants may be increased, and this fact the author considers may be useful when it is desired to increase the content of iron in food used for medicinal purposes.

Field culture of watermelons and muskmelons in southern Russia, N. Kitschunow (*Möller's Deut. Gart. Ztg., 19 (1904), No. 8, pp. 91–94, figs. 5*).—An account is given of the methods observed in southern Russia in the field culture of watermelons and muskmelons, with descriptions and illustrations of a number of different varieties of each.

The garden and the orchard (*Bul. Maine Dept. Agr., 3 (1904), No. 1, pp. 53, figs. 2, dgm. 1*).—This consists of a number of popular articles on various phases of orcharding and gardening, with reports from the various counties of the State on the condition of crops.

Report of the School of Horticulture of Nova Scotia, F. C. Sears (*Halifax, Nova Scotia: School of Horticulture, 1904, pp. 82, pls. 4, figs. 8*).—This is an account of the attendance and work done at the School of Horticulture located at Wolfville, Nova Scotia, during the year 1903. Data are given as to meteorological conditions, fruit now growing in the orchards of the school and the results secured in the use of a number of cover crops, and on certain spraying experiments.

It has been found possible to completely eradicate black knot from a plum orchard which was so seriously affected as to suggest complete eradication as the only successful remedy. In the treatment of this disease all the trees the first year were cut back so severely as to remove all the knots, and in removing each knot the limb for 6 inches underneath was also removed. All the trimmings were then gathered and burned. During the summer the orchard was sprayed 3 times with Bordeaux mixture, and in the fall the knots were again removed and burned. The following season the knots were removed as soon as they appeared, and for this purpose the orchard was gone over twice, once in July and again in August. When the wood was soft it was found possible to pare off a knot instead of cutting away the entire branch on which it grew. This treatment appears to be effective in completely controlling the disease.

The results with cover crops indicated that crimson clover, tares or vetches, and alfalfa are the best cover crops for that province. Crimson clover is believed especially promising. The work of the school in establishing model orchards throughout Nova Scotia has been increased until at the present time there are 23 of these orchards. A table is given showing the number of trees of the different kinds of fruits planted which died during the winter of 1903.

Fruit trees frozen in 1904, M. B. Waite (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 51, pt. 3, pp. 7*).—The author gives an account of his examination of the orchards around Marlboro and Milton on the Hudson River, and also those located at South Glastonbury, Conn., with reference to the damage done to fruit buds by freezing during the winter, with suggestions as to the treatment to be followed in pruning the trees to overcome the effects of freezing.

Nearly 10 per cent of the peach orchards visited were found to be in a completely frozen condition and entirely dead. With others there was slightly less injury, while about a third of the trees were only moderately frozen. The trees most injured were usually those which were planted at low elevations. The injury was greatest above the snow line. It is believed that all those trees on which the bark is stuck tight about 2 ft. above the ground may be expected to live, and many which have the bark partially loosened may recover. Moderate pruning is recommended, to be followed by good cultivation, and unless the land is in very good condition a moderate amount of fertilizer should be added. It is believed that if the buds can push out in the tops growth will extend downward, and in many cases a complete covering of new sound wood can be obtained even over the most injured part on the trunk. Such trees even with dead, black hearts have been found to produce very satisfactorily in Michigan orchards.

"The aim should be, with good cultivation and fertilization, to grow the tree out of the injury. Stable manure will probably answer the requirement in some cases. Nitrate of soda at the rate of 200 lbs. per acre may be preferable in other cases. The choice of the writer would be a complete fertilizer consisting of nitrate of soda, acid phosphate or bone meal, and muriate of potash. Such a fertilizer applied just at the time growth is starting would result in the best possible benefit from the nitrate."

Japanese plums were injured to about the same extent as peaches, and should be handled in about the same manner. Domestic plums were not injured to any great extent. Injury to grapes was noticed to some extent, 2-year vines which reached above the snow line being apparently killed in some cases. In the nursery peach trees were frozen down to the snow line, and all that portion above the snow killed. Such stock is considered perfectly satisfactory for low-headed trees. Where the trees have less than 6 in. of live wood it may be desirable to allow one sprout to grow, and train up a new tree from this sprout after planting in the orchard. Japanese plums in the nursery were killed to about the same extent as peaches. They should be treated in the same way.

Only a few nursery apple trees were hurt sufficiently to cause their rejection. Pear trees were found very severely damaged in the Hudson Valley, apparently to a greater extent than peaches. Pear trees do not possess the same ability to overcome the effects of freezing that peaches do. It is recommended, therefore, that trees under 2 or 3 years of age which are badly frozen should be cut off below the snow line and allowed to sprout.

"All the sprouts that start may be permitted to grow the first year, and if a tall head is preferred they may be pinched back, except the one which is to form the new stem, when they have grown a foot or so. The foliage from these pinched shoots will help contribute to the life and vigor of the tree. In case of badly frozen bearing trees, where the tree is dead and the bark is discolored, of course, they should be dug out; but where there is any vitality left in the bark it may be well to allow the trees to remain at least the first season until it can be determined to what extent they are injured. It takes several years to bring a pear tree into bearing—at least two or three times as long as a peach tree—and one should therefore be correspondingly cautious in cutting down pear trees."

Securing hardy apple roots, A. T. ERWIN (*Orange Judd Farmer, 36 (1904), No. 9, p. 252*).—Attention is called by the author to the serious problem of the root killing of apples in the Northwest. In the East apples are propagated for the most part on French stocks. Experiments are cited in which it is shown that American stocks are much hardier in the Northwest than French stocks, and that the roots of seedling apples grown from Vermont seed are more vigorous and hardier than imported French seedling roots. Farmers are urged to save their apple seeds, especially of the varieties Duchess and Wealthy, and dispose of them to nurserymen who in general are alive to the greater value and hardiness of American stocks.

Stringfellow trees, H. W. Collingwood (*Rural New Yorker, 63 (1904), No. 2824, pp. 206, 217, figs. 5*).—The author gives an account of the planting and growth of a large number of peach trees which were root pruned and set out according to the Stringfellow method; that is, the tops were cut back to a stick 12 to 15 in. long and all side roots cut off so as to leave a stem below ground "as smooth as a lead pencil."

The field in which these trees were set consisted of very light and stony land that had not been plowed for 30 years. Part of it was so poor that only a few coarse weeds would grow on it, while another part was covered with brush and small trees. Before setting out the trees the field was not cleared except for a small space about each tree. In setting the trees the holes were made about 10 in. deep with a crowbar; a little sand was then put in and then the peach tree. More sand was put about the tree, water poured in, and the hole was filled up with earth, packing it firmly around the stub thus planted.

The behavior of trees so treated during the first and second years is noted in detail, and illustrations given of some of the trees. Relative to the final results the author states the case as follows: "From my experience I conclude that trees will certainly live when planted in this way. With me they root deeper and head lower than trees with long roots in large holes. I am quite sure of this. They make a slower growth the first season, but when fully established make wood enough for practical purposes. This method of planting is rapid and cheap. The chief disadvantages that occur to me are as follows: With the small crowbar hole you are likely to leave an air space at the bottom of the root. This will kill or stunt the tree. With a larger hole you can be sure that the soil is packed firmly around the root. While I think the tree without any side roots and packed in a small hole will root deeper, it is better in our practice to leave stubs from 1 to 2 in. long at the side. This anchors the tree firmly in the soil. It will not be whirled about by the wind or lifted by the frost."

Picking and packing apples, C. S. Crandall (*Trans. Illinois Hort. Soc., n. ser., 37 (1903), pp. 575–591*).—Directions are given for picking and packing apples, with statistics on results obtained from an examination of 45 barrels of apples with regard to uniformity in size of fruits, defects caused by decay, apple scab, codling moth, and curculio.

The apple package, J. C. Blair (*Trans. Illinois Hort. Soc., n. ser., 37 (1903), pp. 143–168*).—The author collected a large number of packages of apples as put upon the market from a number of different sections of the United States. The measurements of these are given and the methods observed in packing described. In addition, a discussion is given of the relative value of boxes and barrels in marketing apples, and many quotations taken from trade publications are given.

The results are also given of experiments made at the experiment station at Urbana in packing apples in boxes and selling in the Chicago market. Relative to the value of boxes for apples, the opinion appears to be quite general that only fancy grades of apples should be put up in these fancy packages.

Growing Flat China peaches from seed, G. Monks (*Queensland Agr. Jour., 14 (1904), No. 2, p. 132*).—An account is given of growing Flat China peaches from seed. Many of the seeds would not germinate until after they were cracked. It is especially noted that they fruited true to variety.

Persimmons, A. Dickens (*Industrialist, 30 (1904), No. 20, pp. 307–316, figs. 8*).—A general article on the persimmon, with an account of experiments in growing seedling persimmons at the Kansas Experiment Station. Illustrations showing the seedlings at different stages of growth and the characteristics of flowers, fruit, and tree are included. The average growth of the seedling has been about 18 in. the first year.

Some seedlings at the station have borne only sterile flowers. "The idea that the sterile-flowered trees are necessary for the successful pollination of the others seems

to be erroneous, for trees growing miles from a sterile-flowered one are known to have borne good crops of fruit regularly." In these investigations blossoms of the perfect-flowered varieties have been covered to insure self-pollination, and fruits have been thus secured. It is stated that sterile-flowered trees may be top-grafted with scions from bearing trees. No difference has been noted in the fruit produced from imperfect pistillate flowers and fruit from perfect flowers.

The varieties Daniel Boone, Early Bearing, and Hicks bore fruit 4 years after grafting and 2 years after setting in the orchard. Notes taken from the station records are given on American Honey Seedling, Daniel Boone, Early Bearing, and Hicks.

An experience with persimmon seeds, F. O. HARRINGTON (*Rural New Yorker, 63 (1904), No. 2824, p. 207*).—The author states that he has been successful in sprouting persimmon seeds only after subjecting them to the softening influence of frost. It is thought, however, that they may sprout when treated in the same manner as the dry seed of honey and black locusts. With the latter, the author puts the seeds in a pan and pours on a couple of quarts of boiling water. It is allowed to stand in this 24 hours, when the water is poured off and boiling water again poured on, and the process repeated 24 hours later. It is thought that persimmon seed thus treated would be likely to grow without subjecting it to freezing.

The fig in Georgia, H. N. STARNES (*Georgia Sta. Bul. 61, pp. 47–74, pls. 15*).—The author classifies the various kinds of figs grown in this country, gives detailed directions for the culture of figs in the South, and presents a system of classification of the figs commonly grown in the South based on the form of the leaf.

Some 25 or 26 varieties of figs have been grown at the station and these have been grouped into 5 classes known as Okra, Maple, Spoon-bill, and Oak-leaf types. Illustrations are given of the leaves of the different types and of each variety within the type. Twenty-five varieties grown at the station are described in detail. The idea involved is to systematize present knowledge of varieties and to establish a basis for a more correct nomenclature for southern figs. Plate illustrations are given of the fruit of 18 varieties of figs, of correct methods of pruning figs in the South, and of fig cuttings.

Fertilizer experiments with pineapples and bananas (*Ann. Rpt. Dept. Pub. Gardens and Plantations and Bd. Agr. [Jamaica], 1903, pp. 16–19*).—The tabulated results secured in experiments in 6 different localities with pines and in 9 different localities with bananas, using from 1 to 13 different fertilizer formulas in each case, are given.

In only one case with pineapples was the addition of fertilizers to the soil found beneficial. In one of the experiments in which a test was made of the effect of fertilizers on "monstrous" plants, the results indicated that neither slag, superphosphate, mixed phosphate, or sulphate of potash had any effect in checking the formation of such fruits. With the bananas a number of soils were found on which the addition of fertilizers proved effective in securing increased crops.

A chemical manure for the banana (*Jour. Jamaica Agr. Soc., 8 (1904), No. 3, pp. 97, 98*).—This article is based on the report of M. Teissonnier, director of the Experimental Garden at Conakry, French Guinea, and relates to the manuring of the banana plant in that State. The soils in Guinea in general are lacking in potash and phosphoric acid.

The formula which has been definitely determined upon after 2 years' experimentation at the experimental garden is as follows: Nitrogen 5.47 per cent, potash 11.02 per cent, phosphoric acid 10.2 per cent, and lime 8.17 per cent. About 13 lbs. of this mixture is applied to each clump of bananas during the dry season in fractional applications, 2 lbs. being applied per month. In addition to this it is recommended that the plants receive twice yearly composts of barnyard manure. The cost of manuring is about 1½ francs for each clump of bananas, or about 1,500 francs per hectare per year.

Cultivation of temperate fruit in the West Indies (*Agr. News [Barbados], 3 (1904), No. 48, p. 55*).—Some data are given on the success obtained in the culture of a number of temperate fruits at different elevations in the West Indies. It appears that strawberries may be successfully grown on low lands, while with other fruit like apples, cherries, pears, etc., success is only attained at the higher elevations, and then only to a limited extent. It is believed doubtful to grow these fruits on a remunerative scale.

Chemistry of the dog rose, K. Wittmann (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 2, pp. 68–74*).—The fruit of the dog rose (*Rosa canina*), which is sometimes used in preserves, was analyzed by the author with reference to food constituents of the fruit and mineral matter in the ash. Samples of these fruits were obtained in different years and in a number of different localities, and the results of the analyses of these are tabulated.

Averaging the data the results appear as follows: Water 32 per cent, extract 30 per cent. The dried fruit contained 6 per cent of albumin, 5 per cent of acid, 3.5 per cent of tannin, 18 per cent of sugar, and 3 per cent of ash. Attention is called to the fact that the more common orchard fruits seldom contain more than 0.5 per cent of ash. The lime and ash of the dog fruit varied from 23.18 to 29.41 per cent, the potash from 2 to 4.5 per cent, and the phosphoric acid averaged about 9.4 per cent.

An experiment in shading strawberries, O. M. Taylor and V. A. Clark (*New York State Sta. Bul. 246, pp. 35–58, pls. 2*).—An account is given of the growing of strawberries under shade for two seasons in three different localities in New York. The material used for shading was a thin kind of cheese cloth known as "Bombay." It cost about 4 cts. a yard, and when sewed together and hemmed, with rings attached for securing it, the first cost was at the rate of about $350 per acre. The cover was stretched about 20 in. above the ground. A heavier grade of cloth was used in one experiment.

A record is given showing the temperature of the air underneath the cloth and outside, cloudiness, and evaporation. Generally speaking, the temperature of the air underneath the cloth was a little higher than outside. This was especially true on bright, sunshiny days. For the whole period the temperature underneath the cloth averaged 2.8° higher than outside. The temperature of the soil averaged 1.4° warmer in the morning and 1° warmer at night under the cover than outside. The ground was slightly more moist and the air more humid underneath the cloth than outside. The cloth tempered the severity of the wind so that when a stiff breeze was blowing outside there was not enough wind under the cover to move a sheet of paper lying on the ground. The intensity of light was considerably modified by the covering, while the evaporation was diminished about half, the figures for 19 days being an evaporation of 5⅛ in. in the open and 2½ in. underneath the cover.

The strawberry plants developed normally underneath the shade. This was especially marked during the dry season of 1903, when many plants in the open were killed or seriously injured. As the result of a heavy frost it was observed that many of the leaves and all of the buds of any size not under the cover were dead, while underneath the shade none of the leaves were injured. The injury to the buds of Wilson and Haverland was as follows: With Wilson only 8.6 per cent of the buds shaded were injured, while 80 per cent of those not shaded were injured; with Haverland 6.5 per cent of the shaded buds were injured, while of those not shaded 89.4 per cent were injured. Shading appeared to slightly increase the susceptibility of strawberry plants to leaf blight, and in one case more mildew was observed under the shade than outside. Pollination of the plants was as complete underneath the covering as outside.

As regards the yield, only when thin cheese cloth shade was employed was there any increase. With the heavier grade of cloth there was a marked decrease in yield with every variety grown, and in no case was the increase in yield sufficient to com-

pensate for the cost of the shade. In the case of the lighter grade of cheese cloth there was a considerable increase in the size of the berries obtained; but with the heavier grade no difference was observable in the size of the berries grown underneath the cloth and outside. With the lighter cloth 13 qts. picked underneath the canvas contained 1,102 berries, while 13 qts. picked outside contained 1,452 berries, which shows that the berries were about 15 per cent larger from the shaded plants.

The shaded berries appeared to be a little brighter and glossier than those grown outside, but the difference was not marked. The texture of the berries was not noticeably different except in the case of Marshall, which appeared to be softer and more melting in the mouth than those grown outside. Shaded Ridgeway berries were also softer than those grown outside, and their shipping quality was injured. Analyses were made of berries grown under shade and those grown in the open. The following table shows the comparative composition of the two sorts:

Acid and sugar content of shaded and unshaded strawberries.

	Acid as malic acid.	Sugar as invert sugar.
	Per cent.	*Per cent.*
Marshall:		
Not shaded	1.38	6.54
Shaded	1.27	6.11
Ridgeway:		
Not shaded	1.64	6.35
Shaded	1.59	5.56

From the data given in the above table it is seen that the shaded berries, while slightly less acid than those grown in the open, also contained a smaller percentage of sugar.

In conclusion the authors discuss the effects of shading on plants in general, and the general applicability of shading as a cultural practice. It is believed that shading as a horticultural practice is likely to be most useful in localities having a high percentage of sunshine, a rather light rainfall, and considerable wind with a consequent high rate of evaporation. These conditions are most prevalent in much of the Southwest.

Shading strawberries, F. H. HALL, O. M. TAYLOR, and V. A. CLARK (*New York State Sta. Bul. 246, popular ed., pp. 8, fig. 1*).—A popular summary of the above bulletin.

Some experiments in ringing the Zante, A. J. PERKINS (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 7, pp. 383–385, figs. 3*).—Attention is called to the defective healing of the wounds made when Zante currant vines are ringed and the wounds left exposed to the direct rays of the sun. It was believed that if the wounds were covered over they would heal better. Experiments were therefore made in covering the wounds with grafting wax, bandaging over with a strip of waxed calico, and coating with wax and then bandaging over with waxed calico.

Three weeks after the operations were performed the wounds that had been simply waxed had begun to callus over, while those that had been bandaged had completely healed. No difference was observed between the healing of the wounds that had been simply bandaged and those that had been both waxed and bandaged. As the setting and development of the fruit was equally good on all vines, and as the injury resulting from the wounds which healed over rapidly must have been less serious than where they healed over more slowly, as was the case when the wound was left uncovered, the practice of bandaging is strongly recommended.

It is believed that in ringing by this method a girdle of bark ⅛ to ¼ in. in width may be safely removed if immediately bandaged with waxed cloth. It is considered easier to make this comparatively wide girdle and bandage it than to make a very narrow girdle and not bandage.

The effects of grafting on grapes, L. DANIEL and C. LAURENT (*Jour. Agr. Prat., n. ser., 7 (1904), No. 9, pp. 293, 294*).—Some notes are given on the changes observed in the structure of the leaves of vines as a result of grafting. Analyses are also given of wines obtained from grapes of the same variety grafted on Rupestis du Lot and on 41B Millardet. From the data given the authors conclude that the wine obtained from grafted vines differs sensibly from the wine obtained from vines that have not been grafted. The variations of the different constituents are dependent upon the nature of the varieties.

End-to-end grafting of vines. Tests at Elsenburg, F. T. BIOLETTI (*Agr. Jour. Cape Good Hope, 24 (1904), No. 3, pp. 330–335, figs. 4*).—In experiments at the college it has been found that a skillful grafter could make 300 end-to-end grafts per hour, while by the method of tongue grafting, usually employed, 100 grafts per hour was rapid work. Students who had never grafted before were able to make but 15 tongue grafts with grapes, while by the end-to-end method they averaged 120 grafts per hour.

When grape grafts made by the 2 methods were set in the field there was but little difference observed in their growth when made by skilled workmen. In the case of unskilled workmen the end-to-end grafts grew almost as well as those made by the skilled grafters, while the growth of ordinary tongue-grafted grapes made by unskilled workmen were almost a total failure. When the grafts were uncovered to remove the scion roots it was found that the roots were less numerous on the end-to-end grafts and the work was also much facilitated and hastened by the absence of tying material. On the whole, the results are believed to be much in favor of the end-to-end method of grafting.

Detailed directions are given for end-to-end grafts, and plans shown by which stock and scion may be regularly cut at the same angle, and thus fit more perfectly.

Wine statistics for 1900 and 1901 (*Arb. K. Gesundheitsamte, 20 (1903), No. 2, pp. 155–242*).—Analyses are given of a large number of wines grown in the different parts of Germany in the years 1900 and 1901. The locality from which the wine was made, the variety of grapes used, and the character of the soil on which the grapes grew are given in each instance.

The Jordan and the almond industry, F. GILLET (*Pacific Rural Press, 67 (1904), No. 9, pp. 132, 133*).—The author has planted, in cooperation with this Department, a number of Jordan almond trees and distributed propagating wood to a large number of growers in California. He has also collected information on the amount of almonds imported into the United States from various countries, the comparative weight of nuts and kernels of different varieties of almonds, and other information on the planting of Jordan almonds and its probable adaptability to California conditions.

The Jordan almond is principally used for sugared and blanched almonds. It is imported into this country almost entirely as shelled almonds. There are 6 grades, varying in size from the first grade or "Mammoth" to the sixth or smallest grade, known as "Donkeys." It requires about 75 Jordan almonds for a pound. These contain about 3½ oz. of kernel. It is thus seen that it requires about 4 lbs. of Jordan almonds to produce 1 lb. of shelled kernels; while with the Nonpareil variety, which contains about 240 nuts per pound, 2 lbs. will produce a pound of shelled almonds. The author has found the Jordan the earliest variety of almond to bloom on the Pacific coast. It is believed there will always be a demand for this variety, though the quality may not be quite as good as that of the imported nuts. This, however, is a matter which is still to be determined.

Trees and fruit in North Dakota, C. B. WALDRON (*North Dakota Sta. Bul. 59, pp. 355–385, figs. 7*).—The value of trees and shrubs about the home for ornamentation is pointed out, as well as the necessity of windbreaks of shrubs and trees for growing fruit in North Dakota. Methods of planting trees, size and cost of trees, best methods of cultivation, and the kind of trees most useful for planting in North

Dakota, are discussed. Trees planted for groves should be spaced about 2 ft. apart in the row, with the rows about 8 ft. apart. The elm, ash, and basswood may be used for permanent trees; while trees like the box elder, which makes a quick growth, may be used simply as nurse trees.

Every other tree in the row should be a nurse tree. Other timber trees successful in North Dakota are the silver maple, white willow, golden Russian willow, burr oak, white poplar, hackberry, and American white birch. Directions are given for planting trees in lawns and along streets, and for the best methods of pruning.

The best methods of growing and pruning ornamental and protective hedges are discussed, and also the various kinds of shrubs and trees which may be used for this purpose. The golden Russian willow is considered especially satisfactory for hedges, since it grows readily from cuttings and is very ornamental, and when desired will develop sufficiently to furnish protection for stock.

Strawberries have been successfully grown nearly every year since the station windbreaks have grown large enough to afford protection. For this fruit the shelter should be along the south, as destructive winds come from that quarter. Of the strawberries which have been grown the heaviest yielding varieties mentioned in the decreasing order of their productiveness are Warfield, Tennessee, Prolific, Emperor, Senator Dunlap, Sample, Wm. Belt, Beder Wood, Drouth King, and New York. A very large number of wild plums are growing at the station, and these have proved a very satisfactory fruit.

Some Russian apples have been grown, and in addition Lyman Prolific, Wealthy, Patten Greening, and several crabs as well as other varieties of apples. Apples appear to do best when headed very low. Trees which are headed right at the ground after the original tree has been killed back often prove the most profitable. In setting out trees in Dakota it appears desirable to plant them from 6 in. to a foot deeper than they grew in the nursery. It is not thought advisable to attempt to grow apples without a shelter belt on the south and west side of the orchard. Two-year-old trees, or even root grafts, are believed most suitable for setting out in the orchard.

Trees and shrubs for shade and ornament, F. CRANEFIELD (*Wisconsin Sta. Bul. 108, pp. 60, figs. 47*).—The author discusses the characteristics and value of a large number of trees and shrubs which may be grown for shade and ornament in Wisconsin. Numerous illustrations are given showing the various effects which may be obtained in using different trees and shrubs. The appendix contains lists of the deciduous and evergreen trees and shrubs which have been tested at the station and found satisfactory, as well as a list of those which have been found unsatisfactory. In addition, a list is given of native shrubs desirable for planting on home grounds, and tables showing the comparative height at maturity of different shrubs.

Forcing lilacs after preliminary etherization, G. BELLAIR (*Rev. Hort.* [*Paris*], *76* (*1904*), *No. 4, p. 84*).—In the experiments here noted lilacs etherized for 89 hours flowered 17 days after putting in the forcing house. Snowballs (*Viburnum opulus sterilis*) etherized for the same period attained full flower development 25 days after putting in the forcing house. In these experiments the lilacs were forced at a temperature of 25° C.

DISEASES OF PLANTS.

Potato experiments in 1903, C. D. WOODS (*Maine Sta. Bul. 98, pp. 181–192*).—The experiments reported in this bulletin include a variety test of resistance to blight, study of the effect of Bug Death and Paris green on healthy potatoes and the use of prepared and quick lime in the preparation of Bordeaux mixture. Several rows of a number of varieties of potatoes were planted, a few of each variety being sprayed with Paris green to kill potato beetles and the other half being sprayed with Bordeaux mixture and Paris green. The latter application was made six times during the season.

The results of these experiments are presented in tabular form. It was found that there was a marked difference in the resisting power of different varieties to blight. As a rule early varieties were first attacked. The yield from early varieties was about the same whether dug in September or October, while the yield of late varieties was greatest when dug at the latter date. The yield was sufficiently increased to more than repay the cost of spraying. Bug Death at the rate of 25 pounds per acre for each application was sufficient to destroy the potato beetles, but no larger yields were obtained when this material was used than when the potatoes were sprayed with Paris green. It was found that prepared lime was more convenient to use than lump lime. The cost per pound was greater, but its use caused a saving in time.

Studies in potato rosette, II, A. D. SELBY (*Ohio Sta. Bul. 145, pp. 15–28, figs. 4*).—In continuation of a report on potato rosette (E. S. R., 15, p. 268), an account is given of experiments conducted in 1903 for the prevention of this disease. Rosette seems to be almost universal in its occurrence on early potatoes, causing from 5 to 25 per cent of the plants to be diseased. The preliminary experiments with formalin for the prevention of this disease were so promising that they were continued and comparisons made with formalin, sodium sulphid, lime, potassium sulphid, and corrosive sublimate. Three varieties of potatoes were used in the experiments, the conditions of the different lots being made the same as nearly as possible.

Summing up the results, the author says that they are somewhat variable where the tubers were planted on badly infected soil, but strongly marked and decisive where planted on uncontaminated soil. The results obtained do not show any great difference between the efficiency of sodium sulphid and formalin as a means of treating the seed tubers, yet the simplicity of the formalin treatment is decidedly in its favor.

Investigations in rotation have shown that a three-crop rotation of potatoes is not sufficient for the elimination of this disease. The author recommends for the prevention of potato rosette that all seed potatoes be treated before planting by immersing them for 2 hours in a solution of formalin containing 1 lb. of formalin in 30 gal. of water.

A brief description is given of tomato rosette and a rosette disease of lettuce, both of which are to be the subject of future investigation.

Leaf spot of tobacco, C. J. KONING (*Bladvlekken op Tabak. Amsterdam: J. H. de Bussey, 1903, pp. 8, pl. 1*).—The appearance of this disease is briefly described and notes given on its distribution. The author observed that infection frequently took place through injuries in the leaves caused by the rubbing of leaves together during wind storms.

The bitter rot of apples, W. B. ALWOOD (*Virginia Sta. Bul. 142, pp. 249–279, figs. 15*).—A discussion is given regarding the scientific and common name for the fungus which causes this disease. The author adopts the name *Glomorella rufomaculans*. The fungus is most injurious to fruit, both grape and apple, when nearly at maturity, but it is often observed at much earlier stages. In badly infested orchards composed of unusually susceptible varieties of apple trees, the disease can not be readily controlled. Detailed notes are given on the appearance of the disease, the microscopic character of the fungus, germination of the spores, and character of the mycelium.

In studying the sources of infection evidence was obtained that mummied fruits are largely responsible for spreading the disease. No evidence was obtained to show that cankers on the branches were connected with this disease. Bitter rot was found on trees where no cankered limbs could be discovered, and vice versa. Among the most susceptible varieties are the Albemarle Pippin, York Imperial, Ben Davis, and Winesap. In controlling this disease it is recommended that mummied fruits be removed and destroyed and the trees sprayed with Bordeaux mixture after July 1. Winter treatments appear to have no beneficial results.

Wither-tip and other diseases of citrus trees and fruits caused by Colletotrichum glœosporioides, P. H. ROLFS (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 52, pp. 22, pls. 6*).—During experiments carried out by the author it was found that this fungus was the cause of wither-tip on orange, pomelo, and lemon twigs; leaf spot on the leaves of various citrus trees; and anthracnose on lime blossoms and fruit twigs and on lemon twigs, as well as lemon spot on ripe lemons and canker on limes. These various troubles must, therefore, be considered as different forms of the same disease.

The disease occurs in Florida, West Indies, South America, Australia, and Malta, and causes extensive injuries in some localities. Infection apparently takes place at the tip of twigs or at the edge of the leaf. Fruit infection may be due to bruising the skin. The lime is the most seriously attacked of the various citrus trees. Notes are given on the dangers of infection in lemons while in the coloring house or coloring bed.

The measures to be adopted in preventing the disease depend upon its form. For lemon spot, sulphur spray is recommended as well as ammoniacal solution of copper carbonate. Lime trees may be sprayed with Bordeaux mixture. In isolated trees affected twigs may be cut out and destroyed. Beneficial results may also be obtained from thorough cultivation and from the use of fertilizers which contain plenty of potash.

A Glœosporium rot of cherries, A. OSTERWALDER (*Centbl. Bakt. u. Par., 2. Abt., 11 (1903), No. 6-7, pp. 225, 226, pl. 1*).—A brief account is given of a disease of both red and black cherries, which is said to be due to a species of Glœosporium. The fungus produces a very characteristic appearance upon the fruit and develops a conspicuous stroma beneath the epidermis. The mycelium is colorless. A technical description of the organism is given, and it is compared with *G. fructigenum* and *G. versicolor* which are probably identical, as shown by the investigations of several authors. Infection experiments showed that spores introduced into cherries produced the characteristic spots within 5 to 10 days.

Lectures on the diseases of the sugar cane, L. LEWTON-BRAIN (*Imp. Dept. Agr. West Indies, Pamphlet 29, 1904, pp. 51, fig. 1*).—A series of lectures delivered before the Barbados Agricultural Society, in which the structure and functions of the various parts of the sugar-cane plant are described, and the effects produced by fungi and other agents in destroying the normal activities of the plant are shown.

Following the preliminary statements, three of the more destructive cane diseases are described and suggestions given for combating them. Those described are the rind disease, due to *Trichosphæria sacchari*, the pineapple disease caused by *Thielariopsis ethaceticus*, and the root disease caused by *Marasmius sacchari*. Care in selecting seed cane, cultivation, and rotation where the disease has gained a foothold are recommended, as well as treatment of the cuttings with Bordeaux mixture before planting. The use of this fungicide for preventing attacks of the pineapple disease has given good results. Where the fungi have become well established all diseased canes, trash, etc., should be rigorously destroyed by burning.

ENTOMOLOGY.

Third report of the State entomologist, W. E. BRITTON (*Connecticut State Sta. Rpt. 1903, pt. 3, pp. 199-286, pls. 8, figs. 16*).—A copy is presented of the insect pest law of the State of Connecticut and notes are given on the organization of the office of the State entomologist, publications of this office, and inspection of nurseries. It is hinted that a compulsory fumigation law is contemplated. The nurseries in Connecticut are said to be in about the same condition as during the season of 1902.

A general review is presented of insect conditions during the year under report, with special reference to plant lice, scale insects, tent caterpillars, elm-leaf beetles, etc.

Directions are given for sending insects by mail and a tabulated list is presented of insects and other pests received by the State entomologist for identification. Bulletins 143 of the station (E. S. R., 15, p. 58) and 144 (E. S. R., 15, p. 594) are reprinted. Brief notes are also given on apple aphis, pear psylla, onion thrips, currant borer, cabbage butterfly, *Phengodes laticollis*, etc.

Fourth report of the State entomologist and plant pathologist of Virginia, J. L. Phillips (*Virginia Sta. Spec. Bul., 1903, pp. 63, figs. 13*).—A copy is given of the amended crop-pest law of Virginia and of the rules and regulations which define the duties of the State entomologist.

The field work during the 2 years (1901–1903) covered by this report included the inspection of nurseries and orchards for the purpose of learning the extent and severity of infestation by the San José scale and various insecticide operations in combating this insect. The chief insecticides used were kerosene emulsion, whale-oil soap, and lime-sulphur wash, from all of which satisfactory results were obtained. Recommendations are made concerning the formulas for use in preparing these insecticides. Brief notes are also given on natural enemies of the San José scale and on crown gall of apples.

Monthly bulletin of the division of zoology, H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 1 (1904), No. 11–12, pp. 64, pls. 8, figs. 9*).—Notes are given on methods of preventing various plant diseases and on injurious insects such as San José scale, scurfy scale, oyster-shell bark-louse, apple-tree tent caterpillar, etc. Mention is made of the natural enemies of these insects and most efficient means for combating them. Brief notes are also given on bee keeping, spring frosts, and migration of native birds.

Monthly bulletin of the division of zoology, H. A. Surface (*Pennsylvania State Dept. Agr., Mo. Bul. Div. Zool., 2 (1904), No. 1, pp. 32, pls. 4, figs. 2*).—Brief notes on injuries to trees by freezing, mice, and rabbits. Mention is also made of more important injurious insects of the month of May, methods of poisoning cut worms, destruction of apple-tree borers, and San José scale. Directions are also given for the preparation of various insecticides.

Annual report for 1903 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 310–327, figs. 7*).—Biological and economic notes are given on a number of fruit pests and forest insects. These include the currant gall-mite, raspberry moth, willow weevil, and several species of insects injurious to oak, pine, elm, and beech.

Entomological notes, C. Fuller (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 2, pp. 121–128, figs. 11*).—Notes are given on the habits and life history of *Sesamia fusca*, which is reported as very injurious to corn, and also on the bollworm, cutworms, and gallworms on potatoes. Recommendations were also made regarding the methods of controlling these pests.

Report of observations made by the Entomological Department of the State Agricultural Institute in 1903, Poskin (*Bul. Agr. [Brussels], 20 (1904), No. 1, pp. 56–66*).—A general review is presented regarding the entomological conditions during the season 1903. The author pays particular attention to a discussion of the habits, life history, and means of combating *Gryllotalpa vulgaris*, *Harpalus ruficornis*, and a number of strawberry insects, including crane flies, white grubs, wireworms, cutworms, and *Otiorhynchus sulcatus*.

Report on injurious insects for 1903, W. M. Schøyen (*Beretning om Skadeinsekter og Plantesygdomme i 1903. Christiania: Grondahl & Søn, 1903, pp. 36, figs. 26*).—As usual in the author's annual reports, notes are given on the prevalence of a variety of injurious insects and fungus diseases. These pests are classified according to the plants which they most affect. Special attention is given to the insect pests of cereals, grasses, peas, cabbage, potatoes, celery, fruit trees, forest trees, and ornamental plants. Detailed notes are given on the injuries to strawberries caused by a nematode worm (*Aphelenchus fragariæ*).

Report on the work of the section for plant protection, 1902-3, C. Brick (*Ber. Tät. Abt. Pflanzenschutz, Hamburg, 1902-3, pp. 10*).—During the year under report a much larger quantity of American fruit was imported through Hamburg than ever before. Notes are given on the varieties of fruit represented in these importations and on the extent of infestation with San José scale and other insect and fungus diseases.

More than one-half of the apples imported were Baldwins. A small percentage of apples from all parts of the country were infested with San José scale; some specimens were also found of Forbes scale, scurfy scale, Putnam scale, and oyster-shell bark-louse. Mention is also made of a number of fungus diseases which were found on apples. From Central and South America palms were imported which proved to be infested with a considerable variety of scale insects. Notes are also given on the conditions of nursery stock and plants imported from Japan.

The crop pest law of Georgia (*Georgia State Bd. Ent. Bul. 10, pp. 10*).—A copy is given of the law of Georgia regarding the special inspection of nurseries and nursery stock, the control of insect and fungus diseases, together with the rules and regulations adopted by the State Board of Entomology for this purpose.

Common corn insects, J. M. Stedman (*Mo. Bul. Missouri State Bd. Agr., 3 (1904), No. 11, pp. 11-17*).—Notes are given on the habits, life history, and means of combating chinch bug, corn-root aphis, cutworms, wireworms, and bollworms.

The cotton caterpillar, W. Newell (*Georgia State Bd. Ent. Bul. 9, pp. 14, figs. 4*).—The cotton caterpillar is said to have caused considerable destruction in various parts of Georgia during the season 1903. Notes are given on the life history, habits, and natural enemies of this pest. Experiments were made in dusting cotton plants with a mixture containing 1 part Paris green and 4 parts air-slaked lime. This method was compared with spraying by means of solutions of Paris green and arsenate of lead.

The results of these insecticide applications were encouraging in all cases. Spraying with Paris green seemed to be rather more effective than arsenate of lead or Paris green in a dry form. The chief advantage of the last named method is the ease and rapidity of its application. In wet weather it is recommended that the cotton plants be sprayed with a mixture of arsenate of lead at the rate of 3 lbs. to 50 gal. of water.

The potato beetle, F. Sherman, Jr. (*North Carolina Dept. Agr., Ent. Circ. 9, pp. 8, figs. 2*).—Notes on the distribution, life history, food habits, and means of combating the potato beetle. The remedies most strongly recommended by the author are Bordeaux mixture and Paris green, Paris green and limewater, and Paris green and air-slaked lime.

Holaniara picescens, a beetle injurious to sugar cane, W. Van Deventer (*Meded. Proefstat. Suikerriet West Java, 1904, No. 70, pp. 9, pl. 1*).—This beetle attacks the plant canes, causing great losses in some parts of Java, and is also injurious to the stems of tobacco. Notes are given on its habits and life history. During the author's experiments with insecticides in combating this pest it was found that while in the soil the beetle could be destroyed by using spoiled molasses, which seemed to be quite harmless to the cane cuttings.

Relative resistance of leaf-hopper eggs to hydrocyanic-acid gas, corrosive sublimate, and carbolic acid, C. F. Eckart (*Hawaiian [Sugar Planters'] Sta. Rpt. 1903, pp. 75-80*).—Experiments were made for the purpose of testing certain chemicals and their effects upon the eggs of leaf hoppers of sugar cane. Sections of infested sugar cane were cut and submitted to treatment by these different substances at varying strengths. The solutions of carbolic acid were found to be ineffective in destroying the eggs, while corrosive sublimate and hydrocyanic-acid gas gave more satisfactory results. The vitality of the sugar cane, however, was injured by too long exposure to hydrocyanic-acid gas or by dipping in too strong solutions of corrosive sublimate.

The Hessian fly in 1902-3, H. GARMAN (*Kentucky Sta. Bul. 111, pp. 211-224*).—A series of wheat plats was sown at different stages, beginning September 15 and ending November 10. On September 22, 3 plats were sown for the purpose of testing insecticides. One of these plats was not treated, while the other 2 were divided into equal parts and treated with dilute kerosene emulsion, Paris green and lime, Bordeaux mixture, and lime dust, respectively.

In the spring it was found that many culms had been destroyed entirely and the earlier sowings gave evidence of the greater injury. The plat treated with Bordeaux mixture showed only 19 per cent of infested plants, while later in the spring the percentage of infestation was increased to 43. At harvest time it was found that the effect of late planting was not entirely obliterated. The late-sown plats seemed to be less vigorous than those which were planted earlier. The results in yield of grain were in favor of treated plats planted September 22. Among the plats which were untreated the one which was planted October 6 gave the best yield. The early-sown wheat was harder than the late-sown wheat. A test was made of the germinating power of seed wheat from early and late plantings.

It appeared from this test that the time of planting had little effect upon the germination of the seed. A careful investigation was made to determine whether the Hessian fly infested rye, and no case of infestation could be found, even in the vicinity of the most extensively infested wheat fields. Under especially favorable conditions it seems probable that there may be even more than 3 broods in parts of Kentucky between the time of planting and harvesting wheat. Notes are given on the habits and life history of this insect.

In applying insecticide treatment for Hessian fly the results of the author's experiments indicate that considerable benefit may be obtained, but that this benefit may not be enough to overcome the expense of the application. No treatment is required in the fall, provided the wheat is sown between October 6 and 15. When the insect attacks the wheat in the spring, however, it appears desirable to apply a cheap insecticide, such as kerosene emulsion (4 times) or Bordeaux mixture.

The harlequin cabbage bug, F. SHERMAN, Jr. (*North Carolina Dept. Agr., Ent. Circ. 8, pp. 7, fig. 1*).—Notes are given on the habits, life history, and means of combating this pest. The author recommends the use of trap crops, hand-picking of insects, late planting, and clean culture.

Some experiences with lime, sulphur, and salt washes. Two common scale insects, C. O. HOUGHTON (*Delaware Sta. Bul. 64, pp. 33-48, pls. 3*).—A test was made with boiled and unboiled lime-sulphur-salt washes in 2 localities in the State. Several formulas were used in the preparation of the washes. When the wash was made without boiling it was prepared according to the following formula: Lime 10 lbs., sulphur 5 lbs., caustic soda $1\frac{1}{4}$ lbs., water 15 gal. This wash gave good results, but on the whole was not as satisfactory as the lime-sulphur-salt wash in experiments at Newark.

In experiments at Felton, Elberta peach trees 6 to 7 years old were sprayed just before the buds opened. No injury was done to the trees and practically no difference was observed in the results produced by the boiled and unboiled mixtures. It is recommended that the mixture be applied warm, since the best strength is obtained at that time. The wash is immediately cooled upon being broken up into fine particles by the nozzle and does not come in contact with the tree in a warm condition. If allowed to stand for a few hours, however, the solution becomes considerably weakened and the formation of yellow sliver-like crystals takes place.

A test was also made to determine the proper length of the period of boiling. This period has varied in different experiments from 40 minutes to 4 hours or more. As a result of the author's experiments it was concluded that nearly all of the sulphur can be dissolved within 15 minutes, and a period of 15 to 30 minutes is recommended as giving as good results as a longer period of boiling. The author also recommended that not too much copper sulphate be added to the lime-sulphur wash.

Notes are given on the habits, life history, and means of combating oyster-shell bark-louse and scurfy bark-louse.

Nursery inspection and San José scale, H. GARMAN (*Kentucky Sta. Bul. 110, pp. 195–210, pls. 5, fig. 1*).—This pest is said to have increased considerably in distribution throughout Kentucky during the past 2 years. Notes are given on its present distribution in the State. The author presents a general account of the most satisfactory methods of treating this insect.

The preparation of the lime-sulphur-salt wash is described, with notes on various formulas for this insecticide. Early winter is said to be the best time to spray. Notes are also given on the cost of materials and labor in spraying with this wash, on the use of oil soaps, and on fumigation with hydrocyanic-acid gas. A brief description is given of power pumps and steam cookers. Mention is made of the more important insect and fungus diseases which have thus far been found to occur in Kentucky nurseries. It is recommended that all nursery stock suspected of being infested with San José scale should be fumigated with hydrocyanic-acid gas.

Experiments on the control of the San José scale, T. B. SYMONS (*Maryland Sta. Bul. 90, pp. 24, figs. 4*).—A general account is given of the introduction of the San José scale in Maryland, its distribution, habits, and life history. A series of experiments was conducted in combating this insect with various insecticides applied in spring, summer, and early and late fall.

The results of these experiments are presented in a tabular form. From a study of the experiments it is concluded that whale-oil soap can be applied as a summer treatment in strengths varying from 1 lb. to 2 gal. of water to 1 lb. to 1 gal. of water, without danger to the foliage of apple or peach trees. Only the unprotected insects, however, are killed by this treatment. For summer treatment a 20 per cent kerosene emulsion with soap gave most satisfactory results, while 20 to 25 per cent lime-kerosene emulsion was almost equally effective. Oregon wash was effective but injured the foliage.

Similar results were obtained with crude-petroleum emulsion. All of the early fall applications were effective against the scale, but injured the foliage to some extent. Kerosene emulsion appeared to be the best insecticide for that season of the year. Lime-sulphur-salt wash appeared to be the best remedy for application in November and December. The treatment most strongly recommended by the author is the application of this remedy in the spring just before the buds begin to swell. The wash is about equally effective with or without salt.

The lime-sulphur-soda wash for orchard treatment, P. J. PARROTT, S. A. BEACH, and H. O. WOODWORTH (*New York State Sta. Bul. 247, pp. 59–81, figs. 4*).—The purposes of the experiments reported in this bulletin were to determine the comparative merits of 1 application of sulphur wash in the dormant season (supplemented or not with Bordeaux arsenical mixtures), the usual applications of the Bordeaux arsenical mixtures, the value of the sulphur wash in combating scale and other insects as well as fungus diseases, and the extent to which sulphur wash can be used in replacing Bordeaux arsenical mixtures.

The number of trees upon which the experiments were made was 1,440, consisting of apple, plum, pear, peach, quince, and cherry. The formulas used in the preparation of Bordeaux arsenical mixture and lime-sulphur-caustic-soda wash are given. The application of the sulphur wash was made between March 25 and April 29. The sulphur wash apparently destroyed from 60 to 80 per cent of scales on apple trees and was rather more effective on peach, plum, and pear trees, most of the branches of which were entirely cleared of scales. In a comparative test of the Bordeaux arsenical mixture and sulphur wash in the treatment of codling moth the sound fruit from trees treated with Bordeaux arsenical mixture averaged 98.6 per cent, while that from trees treated with sulphur wash amounted to 75.1 per cent. The application of sulphur wash appeared to reduce greatly the injuries of the early spring leaf-eating

caterpillars. On sprayed trees 13.9 per cent of the leaves and 9 per cent of the apples were injured, while on unsprayed trees 71.7 of the leaves and 50 per cent of the fruit were injured.

The experiments with lime-sulphur-caustic-soda wash indicate that the wash prepared in this way may not give as uniformly good results in the treatment of scale insects as does the common lime-sulphur-salt wash prepared by boiling. The wash proved to be beneficial not only in destroying the insects already mentioned, but in preventing the development of peach leaf-curl and apple scab. The wash is therefore considered to have valuable fungicidal properties.

Sulphur sprays for orchard trees, F. H. HALL ET AL. (*New York State Sta. Bul. 247, popular ed., pp. 11, figs. 2*).—A popular summary of the above bulletin.

Experiments with sulphur sprays for the fall treatment of the San José scale, P. J. PARROTT and J. S. HOUSER (*Ohio Sta. Bul. 144, pp. 13, pls. 4*).—Since sprays containing sulphur seemed to promise good results when used in the fall, a number of experiments were made by the authors to test the value of these remedies when thus applied. In experiments with lime-sulphur-salt wash an orchard was selected which contained 41 peach and 57 plum trees. The wash contained 15 lbs. each of lime, sulphur, and salt per 50 gal. of water, and was boiled for 1 hour.

The results of the application were not immediately manifested, but became apparent during the following season. More new wood and more foliage was produced upon the sprayed than upon the control trees. The San José scale appeared to be practically exterminated as the result of spraying the peach trees. On the plum trees, however, less satisfactory results were obtained. The Oregon wash was tested on peach and plum trees; the formula used contained 15 lbs. of lime, 15 lbs. of sulphur, and 1½ lbs. of copper sulphate per 50 gal. of water. As a rule the trees were much benefited by the treatment.

A soda-sulphur wash containing 20 lbs. of lime, 10 lbs. of sulphur, 10 lbs. of salt, and 5 lbs. of caustic soda per 50 gal. of water, was applied to a number of apple trees. This wash appeared to have little effect in destroying the scale. The formula for the lime-sulphur-salt wash preferred by the authors contains 50 lbs. each of lime, sulphur, and salt per 150 gal. of water, and it is recommended that the mixture be boiled for 1 hour. In fall spraying it is recommended that the application be made as soon as the majority of the leaves have fallen.

Some results with the lime and sulphur washes in Ohio, A. F. BURGESS (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 134–141, pl. 1*).—Experiments were carried on in Ohio during which apple, peach, and pear trees were sprayed with the California and Oregon washes. These treatments were compared with treatment by means of kerosene oil. Formulas are given for the preparation of the washes, together with notes on the cost of materials. The sulphur washes were applied March 14 to 20.

The results of these experiments indicate clearly that the lime and sulphur wash is the most satisfactory winter treatment for the San José scale. It may be applied at any time after the leaves have fallen and is applied more easily if diluted with hot water. The wash has no appreciable effect upon the trees and destroys nearly all of the scale insects. It was also observed that peach leaf-curl was almost entirely prevented by the application of the lime-sulphur wash.

The mulberry scale (Diaspis pentagona), G. LEONARDI (*Bol. R. Scuola Superiore Agr. Portici, 2. ser., 1903, No. 8, pp. 23, figs. 2*).—This scale insect is described in detail in all its stages, and notes are given on its life history. The female scales and young larvæ are most injurious. In combating the pest the author recommends the exercise of strict precaution in quarantining trees received from infested localities, the destruction of badly infested trees, and spraying with kerosene emulsion and emulsions made of heavy tar oils. Copies are given of municipal decrees regarding means of combating this insect, and a list of infested localities is added.

The scale disease of the carob tree, P. GENNADIUS (*Cyprus Jour., 1 (1904), No.*

2, pp. 4, 5).—Notes are given on the habits, life history, and means of combating a number of scale insects which occur in the carob tree in Cyprus. The most important scale insects on this tree are *Lecanium ceratoniæ*, *Mytilaspis ceratoniæ*, *Aspidiotus ceratoniæ*, and *Aonidia aurantii*.

The Coccidæ of Kansas, S. J. Hunter (*Univ. of Kansas, pp. XI+80, pls. 20, fig. 1*).—In this volume the author has brought together a series of 4 articles on the Coccidæ of Kansas. A brief introduction on the study of scale insects is added and also an index.

Winter spraying for the apple aphis, J. M. Aldrich (*Idaho Sta. Bul. 40, pp. 273–288, fig. 1*).—Two species of apple aphis are noted as occurring in Idaho, viz, *Aphis sorbi* and *A. pomi*. The latter is the only one which is sufficiently common to be of economic importance. It apparently does not occur in Idaho upon any wild shrubs or plants. The eggs in this State are laid in October and November and hatch toward the last of April.

Spraying experiments were carried out for the purpose of finding, if possible, a satisfactory treatment for the winter eggs. In these experiments the following substances were used: Pure kerosene, kerosene emulsions of different strengths, sulphur and lime made by different formulas, and a 10 per cent crude-petroleum emulsion. The application of these insecticides was made on April 16 and an examination of the orchard on May 7 indicated that the most successful remedy was the sulphur-lime wash in 1:1:4 proportion. Pure kerosene injured the trees, but destroyed all the eggs. Kerosene emulsion injured the foliage somewhat and did not kill all of the eggs. In case of slight infestation or small trees the eggs may be destroyed by crushing with the hand or by dipping the branches in a pail nearly full of a quassia and whale-oil soap solution, or a similar insecticide.

The woolly aphis, C. Fuller (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 3, pp. 241–246, pl. 1, figs. 3*).—The author discusses the habits and life history of this insect with especial reference to the injury which it causes to apple trees. In combating the aerial form of the pest, the author recommends kerosene emulsion; for the underground form, tobacco dust and hot water have proved effective.

Means of combating rose aphis, A. Hempel (*Bol. Agr. São Paulo, 4. ser., 1903, No. 12, pp. 558, 559*).—Brief notes are given on the use of sheep dips, creolin, kerosene emulsion, etc., in destroying *Siphonophora rosæ*.

Two enemies of orange trees, A. Hempel (*Bol. Agr. São Paulo, 5. ser., 1904, No. 1, pp. 10–21, figs. 3*).—Descriptive and economic notes are given on *Aleurodes citri* and *A. horridus*. The usual treatments which have proved successful in combating these insects are recommended and notes are given on the parasitic insects and fungus diseases which assist in controlling the pests.

Experiments in the control of the olive fly, A. Berlese (*Bol. Uffic. Min. Agr., Ind. e Com. [Rome], 2 (1904), No. 1, pp. 46–75*).—A detailed account is given of the distribution and injuries caused by this fly in Apulia. The injurious attacks of various scale insects are also described, especially those of *Lecanium oleæ*. The injuries due to scale insects are sometimes attributed to the olive fly. In controlling the latter species, the author recommends the destruction or insecticidal treatment of infested olives, together with the use of arsenical sprays.

Lysol and its use in controlling the phylloxera (*Chron. Agr. Canton Vaud, 17 (1904), No. 6, pp. 203–205*).—Attention is called to the exceedingly satisfactory results which have followed the use of lysol in controlling phylloxera. Several badly infested vineyards have been entirely freed from this pest by spraying the trunks of the grapevines for three seasons. The chief advantage in this method consists in the fact that the winter eggs of the insect are destroyed and this obviates the necessity of applying treatment to the underground form of the insect.

The grape leaf hopper (Typhlocyba comes), M. V. Slingerland (*N. Y. Cornell Sta. Bul. 215, pp. 82–102, pls. 9, figs. 4*).—This insect appeared in unusually large

numbers, especially in the Chautauqua grape district in 1901 and 1902. The pest is a native American species and is widely distributed throughout the country. In Chautauqua County, N. Y., it occurred in largest numbers in parts of vineyards near woods or other locations suitable for hibernation.

The insect is described in its different stages and notes are given on its life history. Its food plants include all varieties of grapes, especially the Clinton, Delaware, and Concord, together with the Virginia creeper. The life history of the insect was worked over in detail. It was found that the eggs are usually laid singly on the under side of the leaves. The young nymphs remain in the same situation, where they suck the juices of the leaves. According to the author there is but one whole brood and a partial second brood in New York per year. The adult leaf hoppers seek a location for hibernating about October 1.

It is supposed that this pest is kept in check to some extent by unfavorable weather conditions. There are only a few natural enemies which prey upon the leaf hopper. In experiments with artificial remedies the author cooperated with J. Craig. A series of experiments with sticky shields was carried out, during which a practical form of shield was finally devised. The best time to use sticky shields is late in May or early in June, and the best sticky substance, according to the author's experiments, is a mixture of melted resin in the proportion of 1 qt. to 1 pt. of castor oil.

Spraying experiments showed that the adults could be killed by a mechanical mixture of kerosene and water, containing from 15 to 25 per cent of the oil, while the nymphs were destroyed by spraying with kerosene emulsion, tobacco decoction, or whale-oil soap. Trap lanterns were found to be useless. Considerable benefit may accrue, however, from burning grass or other rubbish under which the hoppers may hibernate. The author's general recommendations for combating this insect include the burning of grass, weeds, and leaves in the neighborhood of vineyards, late fall or early spring plowing for the purpose of burying hibernating leaf hoppers, the use of sticky shields early in June, and spraying with a 20 to 25 per cent mechanical mixture of kerosene and water, or with whale-oil soap at the rate of 1 lb. to 10 gal. of water.

Pathological and physiological observations on coffee, A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 1904, No. 67, pp. 105, pls. 4, figs. 54*).—In this report a number of diseases and physiological conditions of coffee and other plants are discussed.

Considerable attention is given to an account of a red pith disease caused by the attacks of *Pentatoma plebeja.* This insect attacks the leaves and other parts of various varieties of coffee as well as other plants. The method of making punctures in the plant tissues was carefully studied with the result that the lesions caused by these punctures are described in detail. The cell structures of the plants die in the immediate neighborhood of the puncture and lead to the formation of red spots in the leaves and pith. The common name of the disease is derived from this fact.

A general account is given of the fungi which occur in and on coffee plants with brief notes on their importance and means of combating them. The more important species mentioned in the account are *Hemileia vastatrix*, *Glœosporium coffeanum*, *Cercospora coffeicola*, etc. Under certain conditions the flowers of the coffee plant fail to develop normally. These conditions were investigated by the author and notes are given on the causes and means of preventing this trouble. An account is also presented of the variations in form of the fruit of *Coffea liberica.* The author also discusses briefly the injuries done to *Erythrina lithosperma* by nematode worms, and the eradication of *Lecanium viride* by various insecticides, such as mixtures of soap, lime, tobacco, copper sulphate, kerosene, corrosive sublimate, etc.

The "mosquito blight" of tea, II, H. H. MANN (*Calcutta: Indian Tea Assoc., 1904, pp. 20, pls. 8*).—This pamphlet contains a report of the continuation of the

author's work in combating mosquito blight of tea which is caused by *Helopeltis theivora.* It appears from the author's investigation that this insect lays its eggs chiefly during the early part of the day. During the latter part of March the larval insects are much more numerous than the adults. Statistical data are given showing the relative proportion of male and female adults and larvæ.

A number of experiments were carried out with insecticides, during which it was found that isolated plats of tea could be practically freed from mosquito blight by catching the insects and spraying with kerosene emulsion. A single application of kerosene delayed the appearance of mosquito blight for about six weeks. In order to obtain complete success from the use of this method it is recommended that the whole affected area should be thoroughly treated.

The pine sawfly (*Bd. Agr. and Fisheries* [*London*], *Leaflet 103, pp. 4, fig. 1*).—Notes are given on the habits and life history of *Lophyrus pini.* Brief mention is made of the natural enemies of this insect. The pest may be shaken from infested young trees and destroyed or the larvæ may be crushed.

The Mediterranean flour moth, F. L. WASHBURN (*Spec. Rpt. State Ent. Minnesota 1904, Feb., pp. 31, pl. 1, figs. 20*).—The Mediterranean flour moth is said to have appeared in large numbers in St. Paul and vicinity quite recently. Descriptions are given of the insect in its various stages and notes are presented on the usual means by which the pest gains entrance to mills and granaries.

Apparently the chief source of infestation is to be found in old sacks returned to the mill and secondhand machinery from infested mills. Such material should be thoroughly treated before being received in an uninfested mill. The best material for fumigation is carbon bisulphid, and this substance should be used in disinfecting old sacks. Cylindrical metal spouts have been devised which have smooth surfaces within and thus prevent insects from accumulating in grooves and depositing their eggs in such locations. Notes are given on belt brushes for cleaning wooden elevators. It has been found that the insects may be destroyed by exposing the spouts, elevator legs, and machinery to low temperatures in winter for a few days. This freezing period must be followed by a period during which the parts exposed are again heated, otherwise the effects of freezing upon the insects are not very marked.

Other experiments were carried on during which it was found that the moths could fly to considerable distances, but that they could not escape through a wire mosquito netting. Eggs exposed to the vapor of bisulphid of carbon for a few hours fail to hatch. Good results have been obtained from spraying bisulphid of carbon into infested machinery, spouts, etc. Notes are also given on a number of other insects affecting stored grain, among which are granary weevil, Angoumois grain moth, Indian meal moth, meal snout moth, cadelle, etc.

Insects injurious to wheat and other stored grains, G. LEONARDI (*Bol. R. Scuola Superiore Agr. Portici, 2. ser., 1903, No. 7, pp. 12, figs. 8*).—Notes are given on the habits and life history of a number of the common granary insects, with especial reference to the means of combatting them. The author places the greatest reliance in the thorough use of carbon bisulphid.

A preliminary list of Kansas spiders, T. H. SCHEFFER (*Industrialist, 30* (*1904*), *No. 24, pp. 371–386, figs. 7*).—During the author's study of this group of animals it was found that about 100 species occur in Kansas. These species are listed with notes on their habits, life history, and economic relations.

The garden spider and other insects, R. W. SHUFELDT (*Amer. Inventor, 12* (*1904*), *No. 9, pp. 195, 196, figs. 5*).—Notes on the habits and life history of the garden spider, saddle-back caterpillar, grass hoppers, etc.

Galls and insects producing them, M. T. COOK (*Ohio Nat., 4* (*1904*), *No. 6, pp. 115–147, figs. 7*).—In this portion of the author's monograph on galls, attention is called to galls on flowers and fruits as produced by moths, gall mites, and Lepidoptera. Notes are also given on root galls and on the histology of galls produced by

various groups of insects. The author discusses the mouthparts and egg-laying apparatus of various insects in relation to the galls produced on the plants which they infest. A discussion is also given on the morphology of leaf galls and stem galls.

In search for parasites, G. COMPERE (*Jour. Dept. Agr. West. Australia, 8 (1903), Nos. 2, pp. 132–145; 6, pp. 518–524*).—The author relates the results of his observations and researches in various parts of the world while engaged in the collection of beneficial insect parasites.

The mechanism of the movement of insects' wings, L. BULL (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 9, pp. 590–592, figs. 2*).—Brief notes are given on the study of this problem with special reference to the mechanics of insect flight, and the operation and structure of the wings.

Metamorphosis of the Trichoptera, G. ULMER (*Abhandl. Naturw. Ver. Hamburg, 18 (1903), pp. 154, pls. 4, figs. 13*).—A detailed biological account is presented concerning the eggs, larvæ, pupæ, and adults of various representatives of this order of insects, together with notes on the structure of the cases in which the larvæ live. The feeding habits and other biological relations of this group of insects are discussed.

Experimental study of hydrocyanic-acid gas as an insecticide, F. LOPEZ (*Com. Parasit. Agr. [Mexico], Circ. 5, pp. 9*).—In this circular the author recounts his experience in the use of hydrocyanic-acid gas in destroying insects, rats, mice, and other pests in houses. This work was undertaken in connection with the disinfection of houses after the occurrence of contagious diseases. It was found necessary to destroy insects and other pests as well as pathogenic bacteria and hydrocyanic-acid gas gave the best results in this work. Brief notes are also given on the use of this gas in the disinfection of sleeping cars.

Spray mixtures and spray machinery, S. A. BEACH, V. A. CLARK, and O. M. TAYLOR (*New York State Sta. Bul. 243, pp. 315–373, pls. 15*).—The purpose of this bulletin is to present a digest and review of the experiments which have thus far been made at various experiment stations and elsewhere in determining the best insecticide remedies and the best methods for applying them. Detailed directions are given for the preparation of all of the common and important fungicides and insecticides, together with notes on spraying machinery of all kinds. An index appended to the bulletin makes accessible the various details of information.

Practical guide for the study of mosquitoes, EDMOND and ÉTIENNE SERGENT (*Guide pratique pour l'étude des moustiques. Paris: Masson & Co. [1903] pp. 176, figs. 40*).—An historical discussion is given of the general problems relating to the extermination of mosquitoes and the agency of these insects in transmitting various diseases. The authors discuss also in a concise manner the method of examining mosquitoes, their classification, morphology, biology, and means of exterminating them. The blood parasites found in mosquitoes are also briefly noted.

A practical study of malaria, J. W. W. STEPHENS and S. R. CHRISTOPHERS (*London: Longmans, Green & Co., 1903, pp. 378+XXXV, figs. 93*).—A biological and economic account of mosquitoes is presented on pp. 57–257. The anatomy, habits, and life history of various species are discussed with special reference to the relation of these insects to the origin and spread of malaria and to means of combating the pests. In an appendix to the volume the authors present a brief systematic account of blood-sucking flies of various families, together with notes on fleas and related insects.

The warfare against mosquitoes, E. SERGENT (*La lutte contre les moustiques. Paris: J. Rueff, 1903, pp. 96, figs. 27*).—The literature relating to methods for exterminating mosquitoes is discussed in a critical manner, with references to a bibliographical list of 110 titles. Attention is called to the intimate connection between the prevalence of mosquitoes and the ineffectiveness of farm labor as a result of diseases carried by mosquitoes. The usual methods of extermination, including the use of kerosene and drainage, are outlined and strongly recommended.

Proceedings of the first general convention to consider the questions involved in mosquito extermination (*Brooklyn. National Mosquito Extermination Society, 1904, pp. 84, pls. 6, figs. 9*).—The present volume contains an account of the proceedings of a meeting of the National Mosquito Extermination Society held at the rooms of the Board of Trade, New York City, December 16, 1903. At this meeting a considerable number of papers were presented dealing with various aspects of the question of mosquito extermination. Among these papers we may mention the following: Remarks on Extermination Work at Morristown, N. J., by J. Chaflin; Extermination and Exclusion of Mosquitoes from our Public Institutions, by P. H. Bailhache; Government Anti-Mosquito Work, by J. C. Perry; Transmission of Malaria by Mosquitoes, by W. N. Berkeley; Anti-Mosquito Work in Havana, by W. C. Gorgas; Mosquito Engineering, by H. C. Weeks, etc.

Beekeeping for small farmers, W. B. CARR (*Jour. Bd. Agr. and Fisheries [London], 10 (1904), No. 4, pp. 468–475*).—The author discusses the economic aspects of beekeeping and presents notes on the most important bee plants in various parts of Great Britain. Practical directions are also given as a guide to the amateur in selecting a location for an apiary and in caring for the bees.

Studies on the races of bees, E. RUFFY (*Bul. Soc. Romande Apicult., 1 (1904), No. 1, pp. 4–6*).—A brief account of the comparative merits of races of bees.

Bees in walls and attics, DELÉPINE (*Jour. Agr. Prat., n. ser., 7 (1904), No. 16, p. 519*).—Attention is called to the frequency with which swarms of bees become established in the walls or unoccupied rooms of dwellings. Suggestions are made regarding the means of getting rid of such swarms where they prove to be a nuisance and also of utilizing the honey.

Memoir on the future of sericulture, L. DE L'ARBOUSSET (*Bul. Agr. Algérie et Tunisie, 9 (1903), No. 23, pp. 527–530*).—Statistics are presented for the purpose of indicating the gradual development and spread of the silk raising industry. The author formulated a resolution which was adopted by the International Congress of Agriculture at Rome to the effect that silk raising be recommended for further extension throughout the southern portion of Europe, especially along the Mediterranean Sea.

The silk-growing season of 1904, G. MCCARTHY (*Silk, 2 (1904), No. 2, pp. 11*).—A brief account is given of the work thus far accomplished in the recent revival of interest in silk growing in this country, together with notes on the prospects of the silk industry for the season of 1904.

The influence of low temperature during the incubation of silkworm eggs, J. BOLLE (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 173–179*).—The occasion of the investigations reported in this paper was the severe frost which occurred in parts of Austria in April, 1903.

Experiments were carried out during which it was found that temperature variations of 10° C. during the first part of the egg stage were without serious results when of only short duration (48 hours or less). The same may be said of temperature changes of not more than 5° C. for periods of 24 hours during the last part of the egg stage. Pronounced lowering of the temperature for 48 hours or more may have the effect of delaying the emergence of the larvæ, but produces no other consequence of a serious nature. The continuation of low temperature for long periods, however, may caũse outbreaks of flacherie.

During the feeding experiments carried on by the author it was found that no serious results were produced by feeding once a day rather than the usual 4 or 5 times. When the caterpillars were fed only every other day they became very susceptible to flacherie. A study of the fungi in the bodies of dead silk moths disclosed the fact that *Botrytis bassiana* was the common fungus present in moths affected with muscardine. Artificial infection was brought about in about the same proportion and with the same certainty whether the mycelium or spores of this fungus were

used. Fumigation with formalin fumes was found to be an effective method of controlling muscardine.

Investigations on flacherie, S. SAWAMURA (*Bul. Col. Agr., Tokyo, Imp. Univ., 5 (1903), No. 4, pp. 403–448*).—An elaborate series of bacteriological studies was carried on by the author for the purpose of determining the connection of different bacterial organisms with flacherie of silkworms. A number of organisms were found in studying this disease and detailed notes are given on their behavior on different nutrient media.

From the study of diseases of silkworms in connection with inoculation experiments it was found that flacherie is caused by the growth of bacteria in the intestinal juices of silkworms. Various kinds of micrococci were found in such location, together with *Bacillus megatherium* and coli bacillus. *B. megatherium* and one species of micrococcus, *Sarcina lutea*, was found in the eggs of silkworms. About 10 species of micrococci were found on mulberry leaves, and it appears from the author's investigations that flacherie is caused by eating mulberry leaves contaminated with these bacterial organisms.

Under ordinary circumstances, healthy silkworms resist the action of the bacteria. When reared at high temperatures, however, or under unfavorable conditions the worms may become infected. The author believes that flacherie is not caused by any special form of bacteria.

Eleanor Ormerod, R. WALLACE (*London: John Murray, 1904, pp. XX+348, pls. 30, figs. 76*).—This volume is almost entirely occupied with an autobiography of Eleanor Ormerod and selections from her entomological and other correspondence, edited by Professor Wallace. The correspondence reprinted in this volume relates to various problems connected with a great variety of injurious insects.

Supplement to the entomologists' directory, H. SKINNER (*Philadelphia: Amer. Ent. Soc., 1904, pp. 28*).—Lists are given of entomologists whose addresses have been changed and also of additional names and of certain entomologists whose names are to be omitted from future additions of the directory.

FOODS—NUTRITION.

Eighth report on food products, A. L. WINTON ET AL. (*Connecticut State Sta. Rpt. 1903, pt. 2, pp. 107–198, figs. 26*).—The work carried on during the year under the provisions of the State pure-food law is briefly spoken of in the introduction by E. H. Jenkins. The station has collected for analysis 227 samples of food products, 30 samples were submitted by private individuals, and 882 by the State Dairy Commissioner, making a total of 1,139.

Chocolate and other products of the cocoa bean, A. L. Winton, E. M. Bailey, and M. Silverman (pp. 123–145).—Of the 40 samples of chocolate examined 11 were found to be adulterated, 7 were mixtures marked compound, and the remainder were not found to be adulterated. Four of the samples were chocolate or cocoa containing milk or casein. Analyses and other data are discussed at length.

Coffee, A. L. Winton (pp. 145–148).—Seventeen samples of whole and 29 of ground coffee were examined. In every case the whole coffee was found to be pure. Nine of the samples of ground coffee were found to be adulterated, chickory being present in all such cases. In addition to chickory some of the samples contained brown imitation coffee made from wheat flour middlings or pellets made of pea hulls and other ingredients.

Lard, A. L. Winton and A. W. Ogden (pp. 149–155).—Of the 134 samples examined during the year 4 were sold as compound lard. Analyses showed that 48 per cent of the remainder were actually mixtures containing large amounts of cotton-seed oil "and consequently were grossly adulterated."

Food products examined for the dairy commissioner in the twelve months ending July 31, 1903 (pp. 156, 157).—The 882 samples examined included butter, molasses, and vinegar. Of these, 98 samples were found to be adulterated or below the required standard.

The composition of Acheen and Lampong black pepper, A. L. Winton and E. M. Bailey (pp. 158–164).—Analyses of Acheen and Lampong black pepper were made with a view to determining the amount of ash which should be allowed as a maximum in a standard of purity.

The anatomy and microscopic identification of the fruits of darnel and chess, A. L. Winton (pp. 165–174).—The anatomical structure of darnel (*Lolium temulentum*) and chess (*Bromus secalinus*) seeds, which are of common occurrence in wheat screenings, are described and methods of identification proposed which depend upon histological characteristics.

The anatomy of certain oil seeds with especial reference to the microscopic examination of cattle foods, A. L. Winton (pp. 175–198).—The materials studied included hemp seed, upland cotton seed, sesame seed, madia seed or common tar weed (*Madia sativa*), niger seed (*Guizotia abyssinica*), poppy seed, and their products. On the basis of microscopical studies, methods are proposed for the identification of a number of seeds important for the oil they produce and the residue or cake from the oil press, which is used as cattle food or in some cases for human consumption.

Report on work in food laboratory, H. E. BARNARD (*New Hampshire Sanitary Bul., 2 (1904), No. 3, pp. 37–52*).—Data regarding the examination of the various food products and condiments are reported. Of the 290 samples examined 139 were found to be adulterated or to vary from the legal standard. The manufacture and composition of fruit jams, jellies, marmalades, etc., are discussed. Wood alcohol and the harmful effects which attend its consumption are also spoken of.

Adulteration of food (*Ottawa, Canada: S. E. Dawson, 1904, pp. 123*).—Brief statements are made regarding the nature and extent of the work of the official analysts, and the following bulletins of the inland revenue department, which have been previously noted, are reprinted as appendixes: No. 82, Unfermented Grape Juice (E. S. R., 14, p. 894), No. 83, Lime Juice and Catsup (E. S. R., 14, p. 894), No. 84, Cereal Breakfast Foods (E. S. R., 14, p. 892), No. 85, Canned Meats (E. S. R., 15, p. 284), No. 86, Fertilizers, 1903 (E. S. R., 15, p. 349), No. 87, Canned Vegetables (E. S. R., 15, p. 285), and No. 88, Paris Green (E. S. R., 15, p. 279).

Anatomy of the fruits of darnel and chess, A. L. WINTON (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 6, pp. 321–327, figs. 8*).—Noted elsewhere from another publication (see above).

Anatomy of hemp seed, A. L. WINTON (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 7, pp. 385–388, figs. 5*).—Noted elsewhere from another publication (see above).

Cereal foods, E. GUDEMAN (*Jour. Amer. Chem. Soc., 26 (1904), No. 3, pp. 321–324*).—On the basis of an examination of a large number of cereal foods, including analyses and digestion experiments, some general conclusions are reached. The amount of soluble material in raw cereals before digestion, according to the author, varied from 2 to 8 per cent, in prepared cereals, i. e., cooked or roasted, from 4 to 23 per cent, and in malted cereals, from 4 to 60 per cent. It is stated that raw cereals should be cooked for at least an hour in order to render them satisfactory as articles of diet.

"It was found that the raw cereals, if sufficiently cooked, were as quickly digested as the best malted cereals, more quickly than the prepared cereals and a large majority of the so-called malted cereals. . . .

"It was found that the only advantage the prepared and malted cereals have over the raw cereals is that they come to the consumer ready for immediate consumption, and the preliminary preparation of boiling for one hour or so is not required. The claim that the prepared cereals are predigested food applied only to the malted

cereals and only so far as part of the starch has been converted. . . . The differences in the time of digestion, with saliva and pancreatin, between a well-boiled raw cereal and a fully malted prepared cereal is so small that the same can be ignored when determining the relative nutritive ratio and factor of digestibility."

Cereal foods, A. BEYTHIEN, H. HEMPEL, and P. BOHRISCH (*Ber. Chem. Untersuch. Dresden, 1902, pp. 15–17; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 300, 301*).—Among the products analyzed were American cereal breakfast foods.

Farinaceous foods, B. C. ASTEN (*New Zealand Dept. Agr. Rpt. 1903, pp. 21, 22*).—Analyses of flaked oats, flour, and wheat are reported.

The abnormal fermentations of bread, F. C. HARRISON (*British Food Jour., 5 (1903), No. 59, pp. 240–242*).—Sticky bread and other forms of abnormal bread fermentations are described.

Lakton bread, M. MANSFELD (*Ber. Unters. Anstalt. Allg. Oesterr. Apoth. Ver., 1902–3, p. 4; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 301*).—Analyses are reported of 2 samples of so-called "Lakton" bread, made from almonds and recommended for diabetes.

Composition of several sorts of bakers' goods, K. FARNSTEINER ET AL. (*Ber. Hyg. Inst. Hamburg, 1900–1902, pp. 51–53; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 300*).—Analyses of graham bread, pumpernickel, conglutin bread, etc., are reported.

The baking industry from a hygienic standpoint in relation to the trade and to consumers, R. EMMERICH (*Deut. Vierteljschr. Oeffentl. Gesundheitspfe., 35 (1903), pp. 172–199; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 299, 300*).—Existing conditions and the importance of hygienic measures in bakeries, and related topics are discussed.

Comparative milling and baking experiments with foreign and domestic wheats, P. BEHREND and E. KLAIBER (*Fühling's Landw. Ztg., 53 (1904), Nos. 2, pp. 41–51; 3, pp. 73–85; 4, pp. 121–129*).—A number of samples of home-grown and imported wheat were studied with a view to learning their relative value for bread making. None of the bread made was especially poor. In the authors' opinion there is no direct relation between the volume of bread produced and the protein content of the flour.

The catalytic properties of grain and flour, N. WENDER and D. LEWIN (*Oesterr. Chem. Ztg., 7 (1904), No. 8, pp. 173–175*).—The catalases in different cereal grains, whole and ground, and in bean meal were studied in connection with a critical discussion of the theories regarding the action of such bodies.

Thirty-five cc. of hydrogen peroxid was added to 100 gm. of flour mixed with 200 cc. of water and allowed to stand an hour at 20° C. The amount of oxygen liberated varied from 8 cc. in the case of wheat starch to 392 cc. in maize meal 1 year old. Similar tests were made with the different milling products of wheat, the amount of oxygen varying from 64 cc. with wheat flour No. 0 to 246 cc. with wheat flour No. 7½. According to the author, it is evident that the flour ground from the outer portion of the wheat grain is richer in catalases than the inner portion. The author also concludes that the catalytic power is inversely proportional to the fineness of the flour and states that this fact will be taken advantage of in studies on a method of judging the quality of flour.

The composition of hard wheat and hard-wheat gluten, E. FLEURENT (*Ann. Chim. Analyt., 8 (1903), No. 2, pp. 43–45*).—Noted from another publication (E. S. R., 14, p. 378).

Vetches in cereal grains and in human foods, A. SCALA (*Staz. Sper. Agr. Ital., 36 (1903), pp. 695–716; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 297, 298*).—The value of hydrochloric acid, alcohol, ether, chloroform, and sulphurous acid for removing the bitter principle from vetch seed was tested, the most

satisfactory results being obtained with the sulphurous acid. The author believes that on account of its high nutritive qualities, properly prepared vetch flour would be of value in the diet of the Italian poor. Methods of detecting ground legumes in flour were tested.

Experiments on losses in cooking meat, 1900–1903, H. S. Grindley and T. Mojonnier (*U. S. Dept. Agr., Office of Experiment Stations Bul. 141, pp. 95*).—Continuing their investigations on the changes brought about in meat by cooking (E. S. R., 13, p. 772), the authors report the results of 87 experiments with beef and pork, the methods of cooking being boiling, panbroiling, sautéing, and roasting.

The results of the investigations indicate that the chief loss in weight during the boiling, sautéing, and panbroiling of meats is due to water removed by the heat of cooking; in roasting, to the removal of both water and fat. The losses of nutritive material in the panbroiling of meats are very small as compared with those observed in boiling, roasting, and sautéing.

When beef was cooked in water 3.25 to 12.67 per cent of the nitrogenous matter, 0.60 to 37.40 per cent of the fat, and 20.04 to 67.39 per cent of the mineral matter of the original uncooked meat were found in the broth. The nutritive material thus removed is designated a loss, but is not an actual loss if the broth is utilized for soup or in other ways. When meat was sautéed 2.15 per cent of the nitrogenous matter and 3.07 per cent of the ash occurring in the uncooked meat were taken up on an average by the fat in which the meat was cooked, while the cooked meat contained 2.3 times more fat than before cooking. When the meats were roasted 0.25 to 4.55 per cent of the nitrogenous matter, 4.53 to 57.49 per cent of the fat, and 2.47 to 27.18 per cent of the mineral matter present in the uncooked meat were found in the drippings.

Beef which has been used for the preparation of beef tea or broth has lost comparatively little in nutritive value, though much of the flavoring material has been removed.

In the boiling of meats, the fatter kinds and cuts, other things being the same, lost less water, nitrogenous and mineral matter, but more fat than the leaner kinds and cuts. In sautéing, panbroiling, and roasting meat the losses increased in proportion to the degree of cooking. In other words, the longer the time and the higher the temperature of cooking, other things being the same, the greater the losses resulting. As a rule the larger the piece of meat boiled or sautéed, the smaller the relative losses.

The experiments indicate plainly that different cuts of the same kind of meat behave very differently as regards the amount and nature of the losses which they undergo when cooked in hot water. Thorough investigation confirms the conclusion that when meat is cooked in water at 80 to 85° C., placing the meat in hot or cold water at the start has little effect on the amount of material found in the broth.

The ripening of meat, M. Müller (*Ztschr. Fleisch u. Milchhyg., 14 (1904), No. 7, pp. 217–221*).—The ripening of meat is discussed and is due, it is maintained, to autolysis being facilitated by hanging in cold storage.

Judging the degree of putrefaction in meat by means of its succinic-acid content, H. Wolff (*Beitr. Chem. Physiol. u. Pathol., 4, p. 254; abs. in Hyg. Rundschau, 14 (1904), No. 6, pp. 291, 292*).—According to the author large amounts of succinic acid indicate that meat is badly spoiled.

Studies of animal gelatinoids, III, W. S. Sadikoff (*Ztschr. Physiol. Chem., 41 (1904), No. 1–2, pp. 15–19*).—A progress report of investigations on the behavior of purified commercial gelatin, tracheal gluten, and other gelatinoids when treated with salt solutions.

The composition of several new meat preservatives, R. Racine (*Ztschr. Oeffentl. Chem., 9 (1903), pp. 163, 164; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, pp. 318, 319*).—A number of preservatives are described and analytical data reported.

Composition of a number of preservatives, K. Farnsteiner et al. (*Ber. Hyg. Inst. Hamburg, 1900–1902, pp. 18, 19; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 318*).—The composition of a number of commercial preservatives is reported.

The occurrence of leaf lard showing high iodin absorption, W. D. Richardson (*Jour. Amer. Chem. Soc., 26 (1904), No. 4, pp. 372–374*).—In a discussion of the standards recommended for leaf lard by the committee appointed by the Secretary of Agriculture, the author reports determinations of the constants of a number of samples, calling especial attention to the high iodin absorption number of lard from mast-fed pigs. Carcasses of such animals, it is stated, may be easily identified "owing to the fact that even at the freezing point, their fat does not harden, while, if the leaf or back fat of such an animal be placed in room temperature, the oil runs freely from the tissue."

The data reported, in the author's opinion, would indicate "that the limit of 60 [of the proposed standard] is ample, indeed somewhat excessive, for the iodin number of leaf fat from the kind of hog most frequently marketed. The fact remains, however, that we may have samples of leaf lard ranging in iodin value all the way from 50 to 85, and all genuine. That the majority of hogs shipped to our various stock yards will yield a comparatively hard fat indicates simply that such a hog is more easily marketable (more in demand) than the other kind."

The aroma of margarins, P. Pick (*Chem. Rev. Fett u. Harz-Ind., 10 (1903), pp. 175–178; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 7, pp. 415, 416*).—The causes of unpleasant flavor in different sorts of margarin are spoken of, and various methods of improving the flavor are discussed.

Honey, 1903, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 90, pp. 15*).—Of the 99 samples of honey examined 81 were regarded as genuine, 5 as doubtful, and the remainder adulterated. The analytical methods are briefly discussed. A further examination of 13 samples of honey showing right-handed rotation was made by Miss E. Davidson.

Heated honey, K. Farnsteiner et al. (*Ber. Hyg. Inst. Hamburg, 1900–1902, p. 70; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 5, p. 310*).—The changes brought about by the pasteurization of sour honey were studied.

Edible bulbs, J. H. Lagemann (*Jour. Columbus Hort. Soc. 19 (1904), No. 1, pp. 9, 10*).—A note on the use of various bulbs as food.

The coloring matter of red grapes, II, L. Sostegni (*Gaz. Chim. Ital., 32 (1902), II, pp. 17–19; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 6, p. 347*).—Coloring matters were isolated, which, in the author's opinion, were tannin derivatives of protocatechuic acid.

Some cellulosic constituents of orange peel, H. Stanley (*Chem. News, 87 (1903), No. 2267, pp. 220, 221*).—Elementary analyses of the outer and inner layer of orange peel are reported, as well as determinations of furfurol and cellulose in the peel, the effect of acids, alkaline hydrolysis, and the dyeing properties of the cellulose present.

The permissibility of treating cocoa with alkalis, the so-called Holland process, M. Mansfeld (*Oesterr. Chem. Ztg., 7 (1904), No. 8, pp. 175–177*).—On the basis of analytical data, the need of changes in the provisions of the proposed *Codex alimentarius austriacus* for the analysis of cocoa beans and cocoa products is pointed out.

The antiseptic qualities of coffee, W. H. Crane and A. Friedlander (*Amer. Med., 6 (1903), No. 10, pp. 403–407*).—With the object of determining the antiseptic properties of coffee, a number of experiments were carried on. It was found that ground coffee well mixed with the yolks and whites of eggs and with chopped beef prevented decomposition. Coffee infusion exposed to the air became covered with mold on the surface, but never turbid through bacteria. A 10 per cent infusion pre-

vented the growth among other micro-organisms of typhoid and anthrax bacilli, *Bacillus coli communis*, etc. The coffee constituent to which the observed germicidal properties were due was not ascertained.

Distilled liquors, A. McGill (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 92, pp. 17*).—In this investigation of distilled liquors sold in Canada, 216 samples were examined. Those most tampered with were whisky, both rye and malt, and gin. No deleterious substances were found in any of the samples, and the principal adulterant was water.

Cider, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1904, Bul. 94, pp. 3*).—In a study of commercial cider 41 samples were examined. The specific gravity at 15.5° C. varied from 1.0025 with 9.54 per cent alcohol by volume to 1.0688 with only 1.13 per cent. In the case of 17 samples the amount of alcohol by volume was less than 1 per cent and the specific gravity varied from 1.0368 to 1.0627. Two samples of fresh apple juice after filtration had a specific gravity, respectively, of 1.0546 and 1.0573 at 15.5° C.

"Having in view these variations it would seem necessary to obtain, at the place of production, undoubtedly genuine samples of fresh and pure apple juice before drawing any conclusions regarding the samples described in the tables as to their containing added water or sugar." Fourteen of the samples examined contained small quantities of salicylic acid.

Cider vinegar and suggested standards of purity, A. E. Leach and H. C. Lythgoe (*Jour. Amer. Chem. Soc., 26 (1904), No. 4, pp. 375–382*).—Full analyses are reported of a number of samples of vinegar with a view to securing data for formulating methods for the detection of adulteration. According to the authors it is rarely necessary to make a complete analysis to determine whether or not an alleged vinegar is spurious.

"Aside from the determination of acidity and total solids, by far the most important tests consist in the polarization and in the calcium chlorid and lead acetate tests for malic acid. It is rare that spurious vinegar will fail of detection by at least one of these tests. Only in doubtful cases is it necessary to go farther. It is well, however, to be able in some cases to confirm one's judgment by added proof, and where litigation is involved a complete analysis may be helpful."

Ground spices, T. Macfarlane (*Lab. Inland Rev. Dept. Ottawa, Canada, 1904, Bul. 95, pp. 25*).—Of the 188 samples of ground spices examined 88 or 46.8 per cent were regarded as genuine and the remainder doubtful or adulterated. In a note by A. McGill analyses of several samples of ground ginger are reported, the method followed being described.

The composition of some new condiments, J. Graff (*Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 7, pp. 389–392*).—Meat extracts, yeast extracts, i. e., so-called vegetable bouillons, and some miscellaneous goods, such as concentrated soups or soup extracts, are described and analyses reported.

Flavoring extracts, A. McGill (*Lab. Inland Rev. Dept. Ottawa, Canada, 1903, Bul. 89, pp. 16*).—With a view to the detection of adulteration analyses were made of commercial lemon, vanilla, peppermint, raspberry, and other flavoring extracts. The different kinds of extract are briefly discussed.

The dietetic value of patented foods, W. D. Halliburton (*New York Med. Jour. and Philadelphia Med. Jour., 79 (1904), No. 4, pp. 145–147*).—In an address delivered before the American Chemical Society at New York, the author discussed the dietetic value of patent foods, giving special attention to meat extracts, infant foods, and similar goods. The common error of judging foods solely by their composition, the need of instruction in what constitutes true food value, and other related topics were spoken of.

Instruction in judging the nutritive value of the diet of private and public institutions, Lichtenfelt (*Anleitung zur Begutachtung des Nährwertes der Kost Pri-*

vater und der in Öffentlichen Anstalten. Bonn: Friedrich Cohen, 1903, pp. 26; rev. in Hyg. Rundschau, 14 (1904), No. 6, pp. 283, 284).—Data regarding the composition of food are given, which it is believed will prove useful in calculating the nutritive value of diets.

Practical dietetics with reference to diet in disease, ALIDA F. PATTEE (*Somerville, Mass.: Author, 1903, pp. 100; rev. in Home Sci. Mag., 20 (1904), No. 4, p. 199).*—On the basis of experience in teaching cookery in hospitals, the author has prepared this volume of recipes designed for class-room or household use.

Feeding school children in Germany, B. H. WARNER, Jr. (*Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 426, 427).*—In a number of German cities the poorer children are fed in part at municipal expense. The methods followed are briefly described.

Diet suggestions for the Transvaal, F. BOLTON (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 209, 210).*—In the author's opinion meat should be eaten more sparingly than in colder climates. The importance of leguminous vegetables, cheese, and wheat as sources of protein is spoken of; the need of consuming large amounts of water is recognized; and other hints are given regarding a diet suitable for tropical conditions.

Practical cooking manual, C. H. SENN (*London: Universal Cookery and Food Assoc., 1903, pp. 168; rev. in Home Sci. Mag., 20 (1904), No. 4, p. 199).*—Directions are given for the preparation of simple dishes suited to the needs of families with a moderate income.

United States food standards (*Jour. Bd. Agr. and Fisheries [London], 11 (1904), No. 1, pp. 31–34).*—The food standards recently adopted in the United States are discussed with special reference to British farmers and consumers.

Chemistry of human foods and condiments. II, Foods and condiments, their preparation, composition, and properties, J. KÖNIG (*Chemie der Menschlichen Nahrungs- und Genussmittel. II, Die Menschlichen Nahrungs- und Genussmittel, ihre Herstellung, Zusammensetzung und Beschaffenheit. Berlin: Julius Springer, 1904, 4. ed., pp. XXVI + 1557, figs. 44).*—This very comprehensive volume, which constitutes a digest of available information, deals with the composition of foods and condiments, digestibility, theories of nutrition, animal foods and condiments, vegetable foods and condiments, alcoholic beverages, water, air, and the preparation of food. There are also many tables and a detailed index. In every case the topics are very thoroughly discussed, the volume being encyclopedic in its nature and constituting a very valuable reference book for all interested in the subject of nutrition. The present edition has been thoroughly revised and rewritten to include the results of investigations which have accumulated since the last edition was published.

Economy expense book, G. B. WOOLSON (*New Haven, Conn.: George B. Woolson & Co., 1904, pp. 100; rev. in Boston Cooking-School Mag., 8 (1904), No. 9, p. XVI).*—A housekeeper's account book designed to simplify the record of household and other expenses.

Energy value and the useful physiological effect of foods, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 7 (1904), No. 16, pp. 509, 510).*—A résumé of some of M. Rubner's investigations.

Original research regarding human perspiration, etc., J. H. HOELSCHER (*New York Med. Jour. and Philadelphia Med. Jour., 79 (1904), No. 7, pp. 296–300).*—Human perspiration was studied under varying conditions, sweating being induced by hot-air baths and the perspiration collected by enveloping the subjects in sterile gauze covered with oilcloth. Most of the experiments and the conclusions drawn from them have to do with the effects of drugs and similar topics. The following are of more general interest:

As regards the elimination of normal and abnormal substances the skin is not to be compared with the kidneys. One thousand cc. of perspiration contained about 11.5

gm. of solids made up of equal amounts of inorganic and organic material, the urea content being about 0.6 gm., and the nitrogen content 0.47 gm. "A case of chronic constipation and indicanuria did not disclose the presence of indol or skatol in the sweat."

On the morphological changes in the blood after muscular exercise, P. B. Hawk (*Amer. Jour. Physiol., 10 (1904), No. 7, pp. 384–400*).—The experiments which were made with student athletes have to do with the effects of muscular work.

Sanitary precautions in food, A. S. Atkinson (*What-To-Eat, 16 (1904), No. 5, pp. 171, 172*).—The possibility of transmitting disease by eating vegetables exposed for sale where they can be contaminated with street dust is pointed out. The author also notes the importance of washing fruits and vegetables which are eaten raw, in water of known purity.

Food and drink in relation to disease; feeding in relation to the health of the young, J. Niven (*London: Sherratt & Hughes; rev. in British Med. Jour., 1904, No. 2255, pp. 674–676*).—The importance of proper nourishment for children is pointed out and suggestions made for systematic improvement under existing conditions.

Other sources of typhoid infection than through the medium of drinking water, and how to guard against them, S. Harris (*Sanitarian, 52 (1904), No. 413, pp. 310–322*).—Milk, ice, oysters, vegetables—especially those commonly eaten raw—grown on land fertilized with night soil, dust, and flies are discussed as sources of typhoid infection, in addition to those commonly recognized. To avoid the possibility of infection the author believes that vegetables, if eaten raw, should be thoroughly washed in water of known purity, and in boiling water where it will not destroy their flavor. Oysters that are suspected of being infected should never be eaten raw. Flies are regarded as especially dangerous and the need of protecting food from them is pointed out.

ANIMAL PRODUCTION.

The importance of pentosans in feeding stuffs, especially those of rye straw, A. von R. Rudzinski (*Ztschr. Physiol. Chem., 40 (1904), No. 5–6, pp. 317–390, fig. 1*).—From experiments reported in detail the following conclusions were drawn: The formation of pentosans in rye straw is not dependent upon the fertilizers used. They are not evenly distributed in the head, but are found most abundantly in the rachis. Chaff has a considerably higher pentosan content than straw, while the root closely resembles the head in respect to the amount of this constituent present.

As shown by experiments with sheep, the coefficient of digestibility of rye-straw pentosans is 46.825 per cent, a value which is regarded as quite near the minimum. The pentosans in the head and in the chaff were apparently a little less digestible than those in the straw, the coefficient of digestibility being 39.89 per cent. The head and the chaff, notwithstanding the large proportion of nutrients which they contain, do not have the same nutritive value as straw.

Modifying straw by the Lehmann method, i. e., heating the chopped material with a dilute sodium-hydroxid solution for 6 hours under a pressure of 6 atmospheres, increased the digestibility of pentosans to 70.20 per cent and that of the crude fiber to 61.49 per cent. The author points out, however, that straw thus treated is not a satisfactory feeding stuff under all circumstances.

Feeding 6.29 lbs. starch and 1.57 lbs. sugar per 1,000 lbs. live weight diminishes the digestibility of pentosans of rye straw to 12.56 per cent and the digestibility of crude fiber to 9.09 per cent. The pentosans, therefore, are apparently more easily digested than the crude fiber.

Concentrated feeds, J. B. Lindsey et al. (*Massachusetts Sta. Bul. 93, pp. 51*).—The Massachusetts law regulating the sale of concentrated commercial feeds, which was approved March 2, 1903, is quoted. In accordance with its provisions analyses

were made of a number of samples of cotton-seed meal, linseed meal, gluten meal, gluten feed, dried distillers' grains, malt sprouts, wheat by-products, dairy feeds, oat middlings, and rye feed.

The comparative value of different feeding stuffs is briefly discussed; several typical mixtures for dairy animals are suggested, and four rations quoted, which are actually fed by dairymen in Massachusetts.

Commercial feeding stuffs, H. J. WHEELER ET AL. (*Rhode Island Sta. Bul. 98, pp. 63–78*).—In accordance with the State feeding-stuff law, analyses are reported of a number of samples of gluten meals and feed, distillers' grains, barley sprouts, wheat feeds including mixed feeds, proprietary feeds, hominy and chop feeds, provender, corn meal, peanut bran, beef scraps, and bone and meat meal.

"The lots of hominy and provender were quite generally poor, yet . . . this in many cases, particularly as concerns the provenders, was due to the inferior quality of certain of the cereals that were grown in 1902. The poor quality of the 'mixed feeds' was shown to have been due in most cases to gross adulteration with corncob, and possibly other materials of little feeding value."

Licensed commercial feeding stuffs, F. W. WOLL (*Wisconsin Sta. Bul. 109, pp. 3, 4, 6*).—A list is given of 44 brands of commercial feeding stuffs licensed for sale in the State, with the guaranteed composition of each. The State feeding-stuff law is quoted.

Condimental feeds, L. WEIL (*Pharm. Ztg., 48 (1903), pp. 606, 607; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 3, pp. 190, 191*).—The condimental feeds examined were made up of glauber salts, chalk, gentian powder, anis, and other common drugs with the addition of concentrated feeds in some cases.

The use of molasses as a feeding material, E. CUROT, trans. by J. A. MUNN (*Ballière, Tindall & Cox; rev. in Mark Lane Express, 88 (1903), No. 3746, pp. 22*).—A summary of information regarding the feeding value of molasses.

A locally manufactured cattle food (*Agr. Gaz. New South Wales, 14 (1903), No. 7, p. 655*).—An analysis is reported of Maizena cattle food.

The adulteration of feeding stuffs; rice husks and coffee bean husks (*British Food Jour., 6 (1904), No. 63, pp. 55, 56*).—A note on the use of rice husks and coffee-bean husks as adulterants of feeding stuffs in Great Britain.

Results of some recent agricultural experiments, D. A. GILCHRIST (*Newcastle-on-Tyne, [1902], pp. 26*).—Recent English experiments with feeding stuffs and fertilizers are briefly summarized.

Concerning the so-called metallic compounds of proteids in relation to the theory of chemical equilibrium, G. GALEOTTI (*Ztschr. Physiol. Chem., 40 (1904), No. 5–6, pp. 492–549, figs. 9*).—Experiments are reported and discussed.

On the percentage of fat in different types of muscle, J. B. LEATHES (*Jour. Physiol., 31 (1904), No. 1, Proc. Physiol. Soc., 1904, pp. II, III*).—The amount of insoluble fatty acids present as fats, soaps, etc., in different types of muscular tissue (rabbit and cat) was determined. The dried and powdered muscular tissue was extracted twice according to Rosenfeld's method and the combined chloroform and alcohol extracts saponified with alcoholic potash.

The soaps dissolved in a large volume of water were precipitated with sulphuric acid and heated until a sharp separation took place. The precipitated fatty acids were filtered while hot, washed with a large amount of water, dried on a filter in vacuo, and extracted with petroleum ether, the extracts being filtered, dried, and weighed in the usual way. The smallest amount of fat was found in the semimembranosus; the largest amount on an average in the heart. In one case with a rabbit the largest amount was found in the soleus.

On the adaptation of the pancreas, F. A. BAINBRIDGE (*British Med. Jour., 1904, No. 2257, pp. 778–781*).—Experiments were carried on with pancreatic juice obtained from dogs and cats, some of which had special reference to the influence of

secretin on the action of the pancreas. The results obtained showed that this body stimulates the pancreas to secrete a juice containing all the enzyms present in the gland at the moment. "The amount and nature of the ferments, which are present in and secreted by the pancreas at any moment depend not on the action of secretin, but on the previous diet of the animal, and are quite independent of secretin.

"The existence of a chemical mechanism for the adaptation of the pancreas is merely a natural corollary to the chemical mechanism of normal pancreatic secretion. . . . But the mechanism, though in each case chemical, is not of exactly the same nature; the stimulus of secretin calls forth an immediate response on the part of the pancreas, whereas the specific stimulus of the food stuff has a slower, but more prolonged effect.

"Hence, secretin evokes the secretion by the pancreas of all the different enzyms present in the pancreas at the time; and the actual composition of the juice as regards its ferments for any given meal depends mainly on the previous diet of the animal, and little if at all on the nature of that particular meal, except in so far as the nature of the food determines the amount of hydrochloric acid secreted by the stomach.

"The influence of diet in modifying the nature and amount of the enzyms secreted by the pancreas has some bearing on the time of appearance of the ferments after birth. Apparently lactase is not present in the pancreas at birth, although it makes its appearance certainly within 10 days, and in all probability earlier."

The peptone-splitting ferments of the pancreas and intestine, H. M. VERNON (*Jour. Physiol.*, *30* (*1903*), *No. 3–4*, *pp. 330–369*, *dgms. 9*).—The questions studied include the rate of development of the biuret reaction, the law of action of peptone-splitting ferments, the differentiation of trypsin and pancreatic erepsin, the action of peptone-splitting ferments on native proteids and related topics. Among the author's deductions are the following:

"The peptone-splitting power of ferments can be estimated colorimetrically by means of the biuret test. If, for instance, twice as great a volume of the partially digested peptone solution as of the undigested peptone is needed to give the same tint with alkaline copper sulphate when observed in a colorimeter, then 50 per cent of the peptone must have been split up by ferment action. It was found that the biuret reaction took an appreciable time to develop its maximum tint. . . .

"It was found that the time required to split up any given percentage of the peptone varied inversely as the quantity of ferment. . . . Of the peptone splitting effected by pancreatic extracts the larger part is due to pancreatic erepsin, a ferment entirely distinct from trypsin. Thus extracts which have little or no fibrin-digesting power, owing to the existence of the trypsin in the zymogen form, have a considerable peptone-splitting action. When the trypsin has become liberated from the trypsinogen the extract may have twice as rapid an initial action on peptone, but the amount of peptone splitting ultimately accomplished by it is always smaller than that by the zymogen extract. This is presumably due to the free trypsin destroying the erepsin. Neither pancreatic nor intestinal erepsin exists in a soluble zymogen form. The peptone-splitting and fibrin-digesting powers of kept pancreatic extracts vary independently, trypsin being more stable in glycerin extracts and pancreatic erepsin in alcoholic. . . .

"Pancreatic erepsin is much more readily precipitable by alcohol than trypsin [and is] . . . a different ferment from intestinal erepsin. . . . The action both of intestinal and of pancreatic extracts is accelerated by increasing alkalinity up to 0.4 to 1.2 per cent Na_2CO_3, but the intestinal ferment—in contradistinction to the pancreatic—is at the same time more and more rapidly destroyed. . . .

"In confirmation of Cohnheim, it was found that extracts of intestinal mucous membrane had little or no action on fibrin, and very little on egg-white and serum proteids. Even pancreatic extracts had a much slower hydrolyzing action on native proteids than upon Witte-peptone."

The relationship of blood supply to secretion, with special reference to the pancreas, O. May (*Jour. Physiol., 30 (1904), No. 5–6, pp. 400–413, figs. 9*).—Experiments with dogs and cats, which are reported in detail, led to the conclusion that there is no direct relationship between the rate of secretion of pancreatic juice and the extent of the blood supply of the pancreas. Secretion was found to continue for some time after complete cessation of the pancreatic circulation.

The proteolytic activities of the pancreatic juice, W. M. Bayliss and E. H. Starling (*Jour. Physiol., 30 (1903), No. 1, pp. 61–83*).—Noted from another publication (E. S. R., 15, p. 798).

Concerning tryptic digestion, H. R. Weiss (*Ztschr. Physiol. Chem., 40 (1904), No. 5–6, pp. 480–491*).—The effect of a number of salts and other substances upon tryptic digestion was studied. Alkali salts of the halogen acids exercised only a slight effect upon tryptic digestion, the effect of sodium chlorid being the most marked. Sodium oxalate diminished the digestibility more than sodium chlorid. The sulphates also exercised a greater effect than the chlorids. Borax was without effect, while sodium phosphate had a favorable effect.

Investigations on the proteolytic enzyms of the spleen of the ox, S. G. Hedin (*Jour. Physiol., 30 (1903), No. 2, pp. 155–175*).—According to the author's investigations the spleen of the ox includes 2 proteolytic enzyms an α-protease, acting only or principally in an alkaline medium and a β-protease, acting only or mainly in an acid medium. Both enzyms were obtained combined and uncombined with nuclein substances. In the former case they were not soluble in weak acetic acid. Ox serum was found to contain antibodies of the α-protease, but not of the β-protease.

On the presence of the proteolytic enzym in the normal serum of the ox, S. G. Hedin (*Jour. Physiol., 30 (1903), No. 2, pp. 195–201*).—The serum of the ox was found to contain a weak proteolytic enzym, active in an alkaline medium. The properties of this enzym were studied.

Concerning the relation between molecular weight and physiological action in the case of the higher fatty acids. I, Myristic and lauric acid, L. F. Meyer (*Ztschr. Physiol. Chem., 40 (1904), No. 5–6, pp. 550–564*).—As was to be expected from theoretical considerations the fatty acids could not entirely replace fats. In experiments with a dog fatty acids with a lower molecular weight than palmetic, stearic, and oleic acid prevented the cleavage of protein to some extent. Judged by the author's results, myristic and lauric acid are to be considered as nutrients.

The heat of combustion and physiological value of nutrients. IV, Composition and energy value of meat feces, J. Frentzel and M. Schreuer (*Arch. Anat. u. Physiol., Physiol. Abt., 1903, pp. 460–479; abs. in Chem. Centbl., 1904, I, No. 3, pp. 199, 200*).—The elementary composition and energy value of feces were studied in experiments in which dogs were fed meat.

Breeding of live stock in Belgium (*Jour. Bd. Agr. and Fisheries [London], 11 (1904), No. 1, pp. 21–25*).—A brief summary, based on a recent publication of the Belgium Department of Agriculture.

Feeding farm animals (*Iowa Agr., 4 (1904), No. 5, pp. 189–196*).—A summary and discussion of feeding stuffs, rations, and feeding standards.

East Friesian animal husbandry and herds, H. Gross and A. Ellerbroek (*Das Ostfriesische Zuchtgebiet und seine Zuchten. Leipzig: Richard C. Schmidt & Co., 1903, pp. IV+87, figs. 29*).—The feeding, care, and management of East Friesian cattle, horses, and sheep are discussed.

Zootechny: Cattle, P. Diffloth (*Zootechnie: Bovidés. Paris: J. B. Baillière & Sons, 1904, pp. VIII+450, pls. 40, figs. 67*).—The general principles of cattle breeding, cattle raising for milk production and for meat, races of cattle, and other topics are treated of in this volume, which constitutes a handbook of available information on the subject. It is included in the series entitled *Encyclopédie Agricole.*

Fattening of cattle (*Mark Lane Express, 90 (1904), No. 3784, Sup., pp. V, VI*).—The nutritive value of rations is discussed with special reference to that fed the Earl of Rosebery's champion reserve heifer in the carcass competition in the Smithfield Show in 1902. Market requirements and other problems in cattle feeding are also briefly spoken of.

Winter fattening of cattle, J. Wilson (*Jour. Dept. Agr. and Tech. Instr. Ireland, 4 (1903), No. 1, pp. 3–21*).—Recent experiments are summarized and discussed with special reference to cattle under local conditions.

Use of potatoes for cattle food, T. Jamieson (*Agr. Research Assoc. [Scotland] Rpt. 1903, pp. 39, 40*).—On the basis of chemical composition the relative value of potatoes and turnips for cattle feeding is discussed, and brief reference made to the successful use of potatoes by local feeders.

The external conformation of German cattle, A. Lydtin (*Arb. Deut. Landw. Gesell., 1904, No. 90, pp. 141*).—The results of a large number of measurements of cattle and other data are reported, with a view to the establishment of standards for form, size, and weight of different breeds.

Systems of judging cattle by a scale of points and the system recommended by the German Agricultural Society, A. Lydtin (*Arb. Deut. Landw. Gesell., 1904, No. 87, pp. VIII+64, figs. 2*).—Different systems of judging cattle are described. That recommended by the German Agricultural Society is believed to be satisfactory.

Carcass demonstration (*Iowa Agr., 4 (1904), No. 4, pp. 151–154, figs. 2*).—A brief account of a carcass demonstration at the Iowa State College which included 9 steers. All but 1 of these had been used in a test of the relative merits of beef breeds *v.* dairy breeds.

The Asiatic buffalo, H. T. Pease (*Agr. Jour. Cape Good Hope, 24 (1904), No. 3, pp. 367, 368*).—A summary of information regarding the Indian buffalo (*Bos bubalus*), with special reference to its value as a draft and dairy animal for the Cape of Good Hope.

An experiment in mutton production, J. H. Burdick (*Illinois Agr., 6 (1902), pp. 42–46*).—With 4 lots of 4 lambs each the relative value of shelled corn with and without gluten meal, shelled corn and oats, and whole oats was studied, clover hay being fed in addition to the grain. In the 9 weeks covered by the test the greatest gain, 0.52 lb. per head per day, was made by the lambs fed corn and gluten meal 2:1, and the smallest gain, 0.39 lb., by those fed whole oats.

"The result of this experiment favors the use of shelled corn and clover hay for the fattening of lambs, as these feeds produce a first quality of mutton with a high percentage of dressed weight."

Notes on the Angora goat, C. D. Woods (*Maine Sta. Bul. 98, pp. 193–198, figs. 4*).—For the last 2 or 3 years the station has kept a small flock of Angora goats and has studied their adaptability to local conditions and their value for clearing underbrush. It was found to be almost impossible to secure pure-bred goats at a moderate price, so a high-grade buck and grade does were purchased. They were hardy and thrifty, requiring during the winter the same care as sheep.

During the summer they required no extra feed if given an ample range of young woodland or brushy pasture which should contain a shed as a shelter from storms. They were wintered on 750 lbs. of hay per head. The goats were regarded as effective for clearing underbrush in woodland covered with birch or evergreen. In the author's opinion, they would doubtless kill other varieties excepting the very large trees. They also cleared bushes and other waste growth from pastures, such feeds being eaten in preference to grasses. Ordinary fencing would not hold the goats, but a fine mesh-wire fence of such height that they could not rest their fore feet upon it was found to be satisfactory even for small areas. As shown by a test, the flesh had a flavor between lamb and venison.

Angora goats in Australia, R. N. BLAXLAND (*Agr. Gaz. New South Wales, 14 (1903), No. 10, pp. 1028–1035, figs. 12*).—The importance of the goat industry is discussed and a brief historical account of Angora-goat raising in Australia is given, as well as statements regarding its condition at the present time.

Angora goat breeding (*Jour. Dept. Agr. West. Australia, 8 (1903), No. 3, pp. 256–258*).—A brief account of the Australian Angora-goat industry.

Pork production in Illinois, D. S. DALBEY (*Illinois Agr., 6 (1902), pp. 74–80*).—In a discussion of the value of different crops for pork production, a test made by C. A. Rowe of the feeding value of soy beans is briefly reported. On September 11, a lot of 132 pigs, weighing on an average 77.1 lbs. each, was pastured on 4.79 acres of ripe soy beans. In the 4 weeks of the test the lot was fed 108.65 bu. of corn in addition to the soy beans and made an average daily gain of 1.25 lbs. per head. Assuming that 10 lbs. of pork were produced from 1 bu. of corn consumed, it was calculated that the amount of pork produced by the soy beans alone was 647 lbs. per acre.

Feeds supplementary to corn for fattening hogs, E. B. FORBES (*Mo. Bul. Missouri State Bd. Agr., 3 (1904), No. 10, pp. 41–48*).—In an address delivered before a meeting of the Improved Live Stock Breeders' Association, the author summarized and discussed experimental data, the most of which was obtained at the experiment stations.

On the value of distillery dried grains as a food for work horses, C. S. PLUMB (*Indiana Sta. Bul. 97, pp. 37–42*).—The two tests were undertaken to learn the value for horses of Fourex dried distillers' grains as compared with oats. For the first 4 and the last 3 weeks of the first test, 2 of the horses were fed the distillers' grains and 2 were fed oats. For the intermediate period of 4 weeks the rations were reversed. In every case not far from 90 to 95 lbs. of hay per head per week was eaten in addition to concentrated feed.

Marked differences were noted in the quantity of distillers' grains eaten, the average amount in the case of 2 of the horses being 6.64 lbs. per head per week as compared with 31.61 lbs. per head in the case of the other two. The amount of oats ranged from 75.84 lbs. to 94.1 lbs. per head per week. In all cases it was found necessary to accustom the horses to the distillers' grains by adding them in increasing amounts to the oat ration. The average weight of 3 of the horses was slightly greater on oats than on distillers' grains, while with the remaining animal the reverse was true.

In the second test, which was made under practically the same conditions except that some corn was added to the ration, the amount of distillers' grains eaten per head per week ranged from 6.87 lbs. to 54.7 lbs. and the amount of oats from 33.1 lbs. to 68.4 lbs. During the 6 weeks of the test all the animals practically maintained their weight. The author notes that they did not relish the dried distillers' grains and that the amount eaten would not have sufficed for the performance of their ordinary work unless other and more palatable feeds had been supplied.

In brief, the conclusion is reached that the distillers' grains tested are not a palatable horse feed, although judged by chemical composition they possess a high feeding value. The investigation "simply illustrates the special importance of palatability as a factor in the adoption of food stuffs for use in common practice.

The zebrula v. the mule, R. GUENTHER (*U. S. Consular Rpts., 73 (1903), No. 277, pp. 350, 351*).—A brief account of experiments carried on in Germany and elsewhere on crossing zebras and horses.

Poultry division, D. D. HYDE (*New Zealand Dept. Agr. Rpt., 1903, pp. 81–93, pl. 1, fig. 1*).—Data are given regarding the flocks at the different poultry stations, the number of eggs laid by different flocks, poultry exports, and related topics.

Practical poultry raising, C. de Lamarche (*Le poulailler pratique. Paris: Henri Gautier [1904], pp. 106, ill.; rev. in Jour. Agr. Prat., n. ser., 7 (1904), No. 16, p. 525*).—A general treatise on poultry raising.

Poultry and eggs in Denmark, R. R. Frazier (*Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 405–410*).—A summary of information regarding the kind of poultry raised, cooperative associations for egg marketing, preservation of eggs, and related topics.

Eggs and poultry in England, F. W. Mahin (*Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 404, 405*).—A summary of data regarding the British poultry and egg trade from a financial standpoint.

Table fowls (*Jour. Jamaica Agr. Soc., 8 (1904), No. 2, pp. 61–63*).—The suitability of a number of breeds and crosses of chickens for table birds is discussed, and the Old English Game-Minorca cross is recommended as especially satisfactory for local conditions.

Guinea fowls (*Queensland Agr. Jour., 14 (1904), No. 2, p. 108*).—A short summary of data on guinea fowls. Under local conditions they are not regarded as profitable.

Quailology, H. W. Kerr (*Little Sioux, Iowa: Taxiderm Co., 1903, pp. 63, pls. 16, figs. 2*).—This publication deals with the domestication, propagation, care, and treatment of wild quail in confinement. On the basis of personal experience the author discusses incubation, the feeding and care of the young, and related topics. The different varieties of quail are described at considerable length, and letters and other data from quail raisers are quoted.

Ostrich farming with irrigation, F. Frank (*Agr. Jour. Cape Good Hope, 23 (1903) No. 4, pp. 436–439*).—The feeding, care, and management of breeding birds and young ostriches are discussed. Alfalfa is considered an important feed for both old and young birds.

DAIRY FARMING—DAIRYING.

Forage and soiling experiments, 1902, G. C. Watson and T. I. Mairs (*Pennsylvania Sta. Bul. 65, pp. 12*).—The following forage crops were grown during the season: (1) Clover and timothy, (2) flat peas, (3) Canada field peas and oats, (4) rape, (5) soy beans, (6) sorghum, (7) sorghum and cowpeas, (8) cowpeas, and (9) corn. Notes are given on the culture and growth of each of these crops. The following table shows the dates of planting and harvesting, the yield per acre, and the nitrogen content of the different crops:

Data for succession of forage crops.

Crop.	Date planted.	Date harvested.	Yield per acre. Green.	Yield per acre. Dry.	Nitrogen content of dry matter.
			Pounds.	*Pounds.*	*Per cent.*
Clover and timothy	....	June 15–23	6,872	2,319	1.80
Flat peas	....	June 25–July 1	15.588	3,565	3.23
Canada field peas and oats (early sowing)	Apr. 23	July 2–12	17,314	2,405	2.28
Canada field peas and oats (late sowing)	May 12	July 13–21	18,190	2,928	2.22
Rape	May 5	July 24–26	24,960	3,136	1.98
Soy beans	May 12	July 29–Aug. 4	9,934	2,016	2.22
Sorghum	May 13	Aug. 10–19	27,279	4,337	1.33
Sorghum and cowpeas	May 28	Aug. 20–31	29,563	5,519	1.18
Cowpeas	May 28	Sept. 4–11	18,095	4,071	1.50
Corn	June 21	Sept. 14–23	....	....	1.11

The forage crops were fed to 3 cows. The data for the individual cows are given in the following table:

Yield and fat content of milk of three cows fed different forage crops.

Crops.	Length of feeding period.	Cow Lucy.		Cow Letha.		Cow Cena's Favorite.	
		Daily yield of milk.	Fat content of milk.	Daily yield of milk.	Fat content of milk.	Daily yield of milk.	Fat content of milk.
	Days.	*Pounds.*	*Per ct.*	*Pounds.*	*Per ct.*	*Pounds.*	*Per ct.*
Clover and timothy	9	32.18	5.4	33.31	4.9	36.14	4.8
Flat peas	7	32.01	5.4	33.73	4.8	33.96	4.9
Canada field peas and oats (early sowing)	11	29.77	5.3	31.10	4.7	30.73	4.7
Canada field peas and oats (late sowing)	8	30.55	5.1	31.26	4.5	30.94	4.5
Rape	3	26.75	5.2	29.37	4.9	30.70	4.5
Soy beans	7	24.09	4.6	29.66	4.3	28.86	4.4
Sorghum	10	21.34	4.5	26.48	4.3	26.25	4.6
Sorghum and cowpeas	12	19.90	4.6	24.85	4.3	24.71	4.5
Cowpeas	8	22.10	5.2	27.35	4.7	27.42	4.7
Corn	9	20.74	....	25.28	....	25.65	....

The decrease in the milk production of the 3 cows for the entire period of 101 days was, respectively, 35.55, 24.11, and 29.03 per cent; while during the same time the average decrease in the milk production of 10 other cows of the station herd was 37.5 per cent.

Milk investigations at Garforth, 1903, C. CROWTHER (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 268–325, dgms. 6*).—This is in continuation of work reported by Ingle (E. S. R., 14, p. 1113), the object of which was to determine the chief factors influencing the yield and quality of milk. The present investigations were made with 18 cows and lasted 52 days, the object being to determine if the variations in yield and quality of milk due to milking at unequal intervals could be lessened by the method of feeding.

The cows were divided into 4 groups. Group 1 was fed a grain ration consisting of 2 lbs. of undecorticated cotton-seed cake, 2 lbs. of decorticated cotton-seed meal, and 1 lb. of wheat meal, divided equally between the morning and evening feeding. Group 2 was fed 1 lb. of undecorticated cotton-seed cake and 1 lb. of corn meal in the morning, and 1 lb. of cotton-seed cake and 2 lbs. of corn meal in the evening. Group 3 was fed grain only in the morning, the ration consisting of 2 lbs. of undecorticated cotton-seed cake and 3 lbs. of corn meal. Group 4 was fed grain only in the evening, the ration being the same as for group 3. All the cows were fed the same as group 1 for several weeks previous to the experiment.

The results are presented in detail and discussed at considerable length. It was found that changing from a narrow to a wide nutritive ratio increased the yield of milk but decreased the fat content, the change being more pronounced in the morning's than in the evening's milk; and also that feeding all the grain ration in the morning tended to increase the fat content of the morning's milk, which latter result confirms the conclusion previously drawn by Ingle. Feeding all the grain in the evening also tended to increase the fat content of the morning's milk, but had apparently little or no effect on the evening's milk. These changes persisted for a number of weeks after the conclusion of the experiment proper.

While milking at equal intervals is believed to be the best method of preventing the fat content of the morning's milk from falling below the legal standard of 3 per cent, and should be adopted wherever possible, the results nevertheless show that the fat content of the morning's milk may be increased by feeding a liberal supply of highly nitrogenous feeding stuffs in the morning. During the summer months the average fat content of the morning's milk of the herd under investigation was on

most days below 3 per cent. It is noted that similar results have been obtained with other herds in different parts of the country.

Data are given on the effects of sexual excitement on the yield and quality of milk and observations upon the influence of weather conditions on milk production are also reported and discussed. It is stated that a change from an equable to either a decidedly low or a decidedly high temperature tends in the majority of cases to decrease the fat content of the milk.

Milk records, J. SPEIR (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 170–229, figs. 3*).—The Highland and Agricultural Society, in cooperation with local associations, conducted tests of 11 herds in Ayrshire, 11 in Dumfriesshire, and 12 in Wigtownshire. The principal object of the work was to compare the productive capacity of the individual cows in each herd rather than to compare one herd with another. In all, 1,342 cows belonging, with one or two exceptions, to the Ayrshire breed were tested. The records, which cover a period of 6 months, are reported in detail in tabular form.

During the 6 months the best cow produced 731 gal. of milk containing 4.02 per cent of fat. The 90 most profitable cows produced on an average 545 gal. of milk containing 3.84 per cent of fat, and the 90 least profitable cows, 318 gal. of milk containing 3.5 per cent of fat. The cows were classified as small, medium, and large. The small cows averaged 420 gal. of milk containing 3.62 per cent of fat, the medium cows 441 gal. containing 3.69 per cent of fat, and the large cows 464 gal. containing 3.53 per cent of fat.

The average production of 903 cows grouped according to age was as follows: Thirty cows 2 years of age, 362 gal. of milk containing 3.83 per cent of fat; 147 cows 3 years of age, 377 gal. of milk containing 3.87 per cent of fat; 164 cows 4 years of age, 403 gal. of milk containing 3.76 per cent of fat; 137 cows 5 years of age, 421 gal. of milk containing 3.66 per cent of fat; 110 cows 6 years of age, 438 gal. of milk containing 3.63 per cent of fat; 88 cows 7 years of age, 465 gal. of milk containing 3.63 per cent of fat; 80 cows 8 years of age, 468 gal. of milk containing 3.69 per cent of fat; 50 cows 9 years of age, 461 gal. of milk containing 3.63 per cent of fat; 36 cows 10 years of age, 457 gal. of milk containing 3.64 per cent of fat; 28 cows 11 years of age, 464 gal. of milk containing 3.60 per cent of fat; 16 cows 12 years of age, 493 gal. of milk containing 3.48 per cent of fat; 10 cows 13 years of age, 428 gal. of milk containing 3.42 per cent of fat; 3 cows 14 years of age, 375 gal. of milk containing 3.56 per cent of fat; 3 cows 15 years of age, 406 gal. of milk containing 3.39 per cent of fat; and 1 cow 18 years of age, 471 gal. of milk containing 3.74 per cent of fat.

In a large number of cases where the intervals between milkings were equal, the fat content of the evening's milk averaged slightly higher than that of the morning's milk, though the difference was small and considered almost within the limit of experimental error.

Official tests of dairy cows, 1902–3, F. W. WOLL (*Wisconsin Sta. Bul. 107, pp. 43, figs. 21*).—This bulletin contains a brief account of the testing of dairy cows by the station since 1886, a description of the method of making official dairy tests which have been conducted since 1894, a comparison of different systems of testing cows, rules regarding the conduct of official tests, and detailed data for tests of over 200 cows representing Holstein, Guernsey, Jersey, and Red Polled breeds. Illustrations are given of many of the best cows tested during the year.

The average production of the Holstein cows in 7 days was as follows: Cows 5 years old and over (65 tests with 55 cows), 420.4 lbs. of milk and 14.507 lbs. of fat; cows 4 years old (23 tests with 20 cows), 400 lbs. of milk and 13.941 lbs. of fat; cows 3 years old (32 tests with 29 cows), 369.7 lbs. of milk and 12.621 lbs. of fat; cows 2 years old (39 tests with 36 cows), 279.8 lbs. of milk and 9.697 lbs. of fat; and cows below 2 years of age (12 tests with 11 cows), 252.5 lbs. of milk and 8.403 lbs. of fat.

During the year comparisons were made of the results obtained by the system of

monthly 1-day tests conducted by the station, and the results obtained by the breeder himself on the basis of monthly tests of composite samples. The average fat production of 10 Jersey cows as determined by the different methods was 434.9 and 430.5 lbs. and the average fat production of 7 Guernsey cows was 337.1 and 343.9 lbs., the latter figures in each instance being the results obtained by the station. The results are believed to give strong support to the system of monthly 1-day tests.

The influence of food on milk, A. B. GRAHAM (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 43–62*).—A detailed account is given of 3 feeding experiments, the primary object of which was to determine the influence of the amount of water consumed upon the quality of the milk produced. In the author's opinion the quality of milk is largely influenced by the amount of water consumed, and the results of the experiments are believed to confirm this view.

A brief summary is given of some of the literature on this subject, and determinations of the acidity of milk immediately after milking and after aeration and cooling are reported.

The influence of corn cockle on milk production, J. HANSEN (*Landw. Jahrb., 32 (1903), No. 5–6, pp. 899–927*).—Two series of experiments with cows are reported. Feeding stuffs containing 40 to 50 per cent of corn cockle were eaten by cows without any injurious effects. On the whole, corn cockle exerted a more favorable than unfavorable influence upon the total yield of milk, and also on the yield of fat and solids-not-fat. On the other hand, corn cockle exerted a very unfavorable influence upon the quality of butter, and is therefore of doubtful value as a food for cows.

Investigations on the poisonous properties of corn cockle, O. HAGEMANN (*Landw. Jahrb., 32 (1903), No. 5–6, pp. 929–948*).—The results of several experiments with cows, sheep, pigs, and goats indicated that the feeding of corn cockle in the amounts ordinarily found in feeding stuffs exerted no poisonous influence upon domestic animals. The feeding of large quantities to cows, however, exerted an unfavorable influence upon the quality of the butter.

Action of formaldehyde on milk, A. TRILLAT (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 11, pp. 720–722*).—Comparative tests were made of the digestibility in pepsin solutions of (1) casein from milk treated with formaldehyde in varying amounts (1:5000 to 1:20000) and curdled with rennet, (2) casein obtained from freshly curdled milk and suspended in aqueous solutions of formaldehyde of the strength mentioned, and (3) casein obtained from the same source but not subjected to the influence of formaldehyde.

The digestibility of the untreated casein was 5 to 6 per cent greater than that in the first series of experiments, and 30 per cent greater than that in the second series. Previous to the coagulation of the milk formaldehyde was recovered in practically the amounts added, showing no fixation of the antiseptic. Owing to the action of formaldehyde on the gastric mucous membrane, it is believed that its addition to milk should be prohibited.

Milk, T. MACFARLANE (*Lab. Inland Rev. Dept. Ottawa, Canada, Bul. 93, pp. 15*).—This gives the results of the examination of 227 samples of milk collected during the months of November and December, 1903, of which 159 samples were found genuine or unadulterated.

The milk supply of large towns, F. W. HARRIS (*British Food Jour., 6 (1904), No. 62, pp. 26–30*).—A general discussion of this subject with special reference to the milk supply of Glasgow, analytical data being given.

Studies and observations on milk in the region of Padua, G. ROSSI (*Staz. Sper. Agr. Ital., 36 (1903), No. 10–12, pp. 893–925*).—The author presents a descriptive account of the conditions observed in dairies in the vicinity of Padua and gives the results of a large number of analyses of milk samples.

Sanitary milk—its future, R. A. PEARSON (*Cornell Countryman, 1 (1904), No. 6, pp. 168–170, fig. 1*).—Notes are given on the production of sanitary milk and on the outlook for this branch of the dairy industry.

Preservation of milk by hydrogen peroxid, A. RENARD (*Abs. in Jour. Soc. Chem. Ind., 23 (1904), No. 2, p. 74*).—Observations are given on the rate of decomposition of hydrogen peroxid in milk. A quantity not exceeding 2 per cent of a 12-volume solution was completely decomposed in from 6 to 8 hours. With the addition of 5 per cent of a 12-volume solution the decomposition was not complete after several days.

While a small quantity of hydrogen peroxid does not sterilize the milk, the keeping qualities are much improved. The milk preserved with 1, 2, and 3 per cent of a 12-volume solution remained sweet for 24, 26, and 32 hours, respectively, at 20° C., while milk not preserved soured in 13 hours. It is considered best to add the hydrogen peroxid immediately after milking and keep the milk in a cool place for 6 to 8 hours until the hydrogen peroxid is completely decomposed.

The presence of a lipase in milk, C. GILLET (*Jour. Physiol. et Path. Gén., 1903, No. 3; abs. in Rev. Gén. Lait, 3 (1903), No. 4, pp. 89, 90*).—The investigations were made with human milk obtained with every aseptic precaution. Only exceptionally was the milk sterile. *Staphylococcus pyogenes albus* was almost constantly present and *S. pyogenes aureus* occasionally found. Both sterile and contaminated milk caused a decomposition of monobutyrin. This action was not increased by the development of bacteria in the milk, but was destroyed by a high degree of acidity.

Pure cultures of the bacteria found in the milk were not able to decompose the glycerid. The activity of the ferment was diminished but not prevented by the addition of sodium fluorid or chloroform. The ferment was not destroyed by the coagulation of the milk. It resisted temperatures to 60–65° C., and was found to have no action on other glycerids than monobutyrin, and ought therefore to be designated merely a monobutyrinase rather than a lipase. The monobutyrinase was found also in the milk of the cow, ass, and goat.

It is believed that a number of enzyms exist in milk, anaerobic oxydase, monobutyrinase, and amylase being mentioned. It is considered that no satisfactory explanation concerning the physiological rôle of these ferments has yet been offered.

The oxidizing ferment in milk, L. M. SPOLVERINI (*Rev. Hyg. et Méd. Infantiles, 3 (1904), No. 2, pp. 113–155*).—The author discusses oxidizing ferments in general and reports extended investigations on the oxidizing ferment in the milk of the cow and goat, and in human milk. A distinction is made between the direct oxidizing ferments, or the oxydases which have the power of utilizing directly atmospheric oxygen, and the indirect oxidizing ferments, or anaerobic oxydases which are incapable of oxidizing substances in the presence of atmospheric oxygen alone, but which require an intermediate substance rich in oxygen, as for instance, hydrogen peroxid. Some of the conclusions drawn from the results as a whole are noted below.

Under normal conditions anaerobic oxydase is constantly present in considerable quantities in the milk of cows and goats, in which the ferment is found uniformly diffused throughout the milk serum and is not in combination with cellular elements.

Human colostral milk always produces a noticeable oxidizing action, due to the presence of organized elements in the milk. While the amount of the anaerobic oxydase in human milk varied considerably in the 57 cases under observation, its complete absence was very rare. In human milk containing colostral corpuscles the oxydase was believed to exist mainly within the organized elements, while in other milk it was found to be diffused throughout the serum.

The anærobic oxydase of the milk of cows and goats was believed to be a product of normal elimination. This was thought to be only exceptionally the case in human milk. By modifying the food of a goat, as by feeding the oxidizing ferment, the amount of the oxydase in the milk and in the urine was made to increase or decrease. The characteristic reaction of anærobic oxydase was thought to be due to two special ferments, one decomposing the hydrogen peroxid, and the other fixing the oxygen.

The ferments of milk: An experimental and critical study, H. VAN DE VELDE and J. DE LANDSHEERE (*Ann. Soc. Medico-Chirurg. Anvers, 1903; abs. in Rev. Gén. Lait, 3 (1903), No. 5, pp. 111, 112*).—Conclusions of Spolverini that soluble ferments in certain foods consumed by goats and cows pass into the milk were tested with cows fed germinating barley rich in amylase. No amylase was found in the milk, and the results of Spolverini are attributed to the presence of bacteria.

Contribution to the knowledge of spontaneous coagulation of milk, UTZ (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), Nos. 20–22, pp. 600–631; 24–25, pp. 733–739*).—The results of investigations led to the following conclusions: The acid formed in the spontaneous coagulation of milk is either dextrolactic acid or inactive lactic acid, or a mixture of the two forms. The variations in the nature of the lactic acid formed has not as yet been satisfactorily explained.

The temperature at which the fermentation takes place influences the period of coagulation, but is without decisive influence on the kind of lactic acid formed. *Bacterium acidi lactici* forming dextrolactic acid, and *B. acidi lævolactici* forming levolactic acid, are the principal organisms concerned in the spontaneous coagulation of milk, the first mentioned being by far the most common. The organism forming dextrolactic acid isolated by the author is believed to be identical with the organism described by Hueppe, Günther and Thierfelder, Leichmann, and Clauss and Kozai; and the organism forming levolactic acid identical with the bacillus of Clauss and Kozai, and probably also with the *B. acidi lævolactici* of Schardinger.

Bacteria in the teats of the cow, goat, and sheep, O. UHLMANN (*Thesis, Jena, 1903; abs. in Rev. Gén. Lait, 3 (1904), No. 7, pp. 163, 164*).—Thirty-five teats of cows, goats, and sheep were hardened in alcohol, sectioned serially, and stained with thionin. Over 800 sections were studied. Milk was never present in the capillary ducts except in very small quantities, and was often entirely absent. Bacteria, on the contrary, were present in every section, occasionally as many as a hundred, but generally only in small numbers. Micrococci predominated. The bacteria were less numerous in the teats of goats and sheep than in those of cows.

The dairy law and its results, J. B. LINDSEY, N. J. HUNTING, and E. B. HOLLAND (*Massachusetts Sta. Spec. Bul., July, 1903, pp. 14, fig. 1*).—The text of the dairy law in Massachusetts is given, the results of inspection of glassware and Babcock machines are reported, and notes are given on making the Babcock test.

Creamery butter making, J. MICHELS (*Lansing, Mich.: Author, 1904, pp. 271, pl. 1, figs. 74*).—This is designed as a handbook to be used by the student in conjunction with lectures on butter making, as well as by the butter maker who can not attend a dairy school, and seems well suited to this purpose. "Special emphasis has been laid upon starters, pasteurized butter making, methods of creamery construction, and creamery mechanics, subjects which have usually been treated only in a very elementary way in similar publications that have appeared heretofore." Historical matter and references are in the main omitted. A glossary is appended.

The use of liquid cultures of milk ferments in the souring of cream, G. FASCETTI (*Staz. Sper. Agr. Ital., 36 (1903), No. 10–12, pp. 997–1003*).—As a result of experiments carried out by the author along this line it was found that the use of milk ferments was of considerable advantage. The time required for churning was somewhat reduced, thus making a saving of labor. The flavor of the butter was improved in some cases.

The interdependence of the physical and chemical criteria in the analysis of butter fat, T. E. THORPE (*Jour. Chem. Soc. [London], 85 (1904), No. 496, pp. 248–256, dgms. 6*).—Determinations were made of various analytical constants on samples of butter of known origin and made from milk obtained under varying conditions. In all, 357 samples were analyzed. This article comments briefly on

the methods of analysis and the results obtained, and summarizes the data in the table given below:

Constants of butter fat.

Number of samples.	Reichert-Wollny number.	Specific gravity at 37.8° C.	Saponification number.	Refractometer number at 45° C.	Soluble acids as butyric.	Insoluble acids.	Mean molecular weight of insoluble acids.
					Per cent.	*Per cent.*	
7	22.5	0.9101	255.4	42.0	4.3	90.1	266.9
17	23.5	.9104	253.4	41.5	4.5	89.7	265.5
15	24.5	.9108	251.3	41.5	4.7	89.4	265.0
27	25.5	.9110	251.1	41.3	4.8	89.3	264.2
37	26.5	.9113	248.9	41.0	4.9	88.9	261.9
51	27.5	.9114	247.4	40.6	5.2	88.7	261.7
78	28.8	.9118	245.7	40.1	5.4	88.4	260.9
56	29.5	.9120	244.0	40.1	5.6	88.3	259.6
41	30.5	.9123	242.4	39.9	5.8	87.9	260.1
18	31.3	.9125	241.5	39.7	5.7	87.9	258.0
10	32.6	.9130	241.2	39.4	6.0	87.7	257.8

In general the specific gravity increased with the Reichert number, and the saponification and refractometer numbers decreased. A low proportion of volatile acid was associated with a high percentage of oleic acid. Twenty samples showed an average Reichert number of 24.2 and an iodin number of 40, and 30 samples an average Reichert number of 30.8 and an iodin number of 32.4.

Sodium fluorid for the preservation of butter, F. JEAN (*Ind. Agr. Prog.* [*Valenciennes*], *1903, No. 293; abs. in Rev. Gén. Lait, 3* (*1903*), *No. 4, p. 91*).—While condemning the use of antiseptics in food products the author would make an exception of sodium fluorid as a means of preserving butter, arguing that when properly used for this purpose the daily consumption of 60 gm. of butter would mean the ingestion of 6 mg. of the fluorid, an amount considered entirely unoffensive, and which would moreover be rendered inert by the lime in the food and digestive secretions.

Chemical changes in the souring of milk and their relations to cottage cheese, L. L. VAN SLYKE and E. B. HART (*New York State Sta. Bul. 245, pp. 36*).—The authors have studied the formation of casein monolactate and casein dilactate in the ordinary souring of milk, and have considered the results obtained in their relation to the manufacture and digestibility of cottage or Dutch cheese.

To study the relation existing between the disappearance of milk sugar and the formation of lactic acid, with the subsequent formation of casein monolactate and casein dilactate, fresh separator skim milk, with and without pasteurization and the addition of a starter, was kept at room temperatures and examined at frequent intervals. In all cases the milk sugar was found to decrease rapidly during the first 32 hours, after which the change was slow, ceasing entirely at the end of 72 to 96 hours. On an average 11 per cent of the milk sugar disappeared in 8 hours, 21 per cent in 24 hours, 25.5 per cent in 32 hours, 26 per cent in 48 hours, 27 per cent in 72 hours, and 27.6 per cent in 96 hours.

The maximum amount of acid calculated as lactic, was about 0.9 per cent, which was equivalent to only about 62 per cent of the milk sugar that disappeared. The equation $C_{12}H_{22}O_{11}+H_2O=4C_3H_6O_3$, while expressing the most prominent chemical action which occurs, is therefore not believed to give anything like a complete or accurate statement of the entire chemical action. Under the conditions of the experiment the milk coagulated in from 24 to 29½ hours, the acid content of the milk at the time of coagulation varying from 0.6 to 0.7 per cent. At the beginning of coagulation the amount of casein in the form of monolactate was 13 to 14 per cent, and in the form of dilactate, 86 to 87 per cent. Later the monolactate was

practically all converted into the dilactate. In one experiment the casein monolactate in milk before coagulation was visible amounted to 65 per cent of the casein. No dilactate was then present.

In studying cottage cheese attention was paid to the relative amounts of monolactate and dilactate present, the conditions most favorable for the manufacture of such cheese, the manufacture of cottage cheese with artificial acids, the question of the occurrence of a ripening process such as takes place in Cheddar cheese, and the digestibility of cottage cheese in pepsin solutions. The experimental work is reported in detail, and is summarized in essentially the form given below.

"*Yield and composition of cottage cheese.*—The yield of cheese from 20.5 lbs. of milk varied from 3.56 to 4.63 lbs. under the conditions tried. The moisture in cheese varied from below 70 to over 80 per cent. The variation in moisture accounts largely for the variation in yield. The amount of moisture in cheese is dependent upon the temperature used in curdling the milk and in heating the curd to expel moisture and also on the length of time the curd is heated. Cottage cheese of the best texture should contain 70 to 75 per cent of moisture. Best success was attained when milk was soured and curdled not much above 70° F. (21° C.) and the subsequent heating was not carried above 90° F. (32° C.). Milk sugar in the cheese varied from 3.28 to 4.08 per cent, which is equivalent to 10 to 16 per cent of the sugar originally present in the milk. Of the sugar in the milk 23 to 27 per cent was decomposed in the souring. Nitrogen in cheese is mostly in the form of casein dilactate, equivalent to 2 to 2.5 per cent of nitrogen.

"*Manufacture of cottage cheese by direct addition of an artificial acid to milk.*—Milk was coagulated by addition of lactic acid and hydrochloric acid and the curd made into cottage cheese. Satisfactory results in every respect were secured. For example, hydrochloric acid (sp. gr. 1.20), diluted with 10 times its volume of water, was added to milk in the proportion of 8 ounces for 100 lbs. of milk at 75° F. (24° C.) and stirred vigorously. The curd separated at once in flocculent form and was strained from the whey without further heating. Any absence of sour-milk flavor can be supplied by mixing with the cheese some ripened cream. Cheese made in this way contains more milk sugar and more nitrogen than cheese made by the ordinary method of souring milk.

"*Slight change of insoluble into soluble nitrogen compounds in cottage cheese.*—Cottage cheeses were made by ordinary souring method from whole milk and from pasteurized and unpasteurized skim milk, with and without rennet, and were examined at intervals to ascertain to what extent insoluble nitrogen compounds change into soluble ones, as in the case of Cheddar cheese. Such proteolytic changes as occurred in 2 to 3 weeks were insignificant.

"*Artificial digestion of some compounds of casein and paracasein contained in cottage cheese.*—According to popular belief, fresh cottage cheese is more readily digested than Cheddar cheese. To test this by laboratory methods, we have subjected to pepsin digestion, without hydrochloric acid and with hydrochloric acid in varying proportions, fresh cottage and Cheddar cheese, in which we had one or more of the following substances: Paracasein, paracasein monolactate in Cheddar cheese, paracasein dilactate, casein monolactate, casein dilactate (cottage cheese) prepared by normal souring of milk and also by direct addition of lactic acid to milk, and casein dihydrochlorid. In the absence of acid, paracasein fails to be digested by pepsin, while paracasein monolactate (the chief nitrogen compound of fresh Cheddar cheese), paracasein dilactate, casein monolactate and casein dilactate (cottage cheese) are partially digested. Paracasein monolactate and casein monolactate, in the absence of acid, are digested more than are paracasein dilactate and casein dilactate. In the presence of 0.4 per cent of hydrochloric acid, paracasein dilactate is digested by pepsin more than is paracasein monolactate. Paracasein monolactate and dilactate and casein monolactate and dilactate and casein dihydrochlorid digest more readily and

completely in the presence of free hydrochloric acid than in its absence. Casein dilactate and casein dihydrochlorid do not differ in the rapidity and extent to which they are converted into soluble compounds by pepsin. The addition of acid after the beginning of the digestion increases the amount of proteid digested, whether we use cottage cheese or Cheddar cheese. Cottage cheese made from whole milk digests more rapidly than that from skim milk, owing to the loose texture of the former. Fat in such cases does not impede digestion. The rapidity of digestion is dependent in part upon the fineness of division of the material to be digested. Cottage cheese as ordinarily consumed is in a state of finer division than Cheddar cheese. Cottage cheese may be properly regarded as more readily digestible than new Cheddar cheese for two reasons: First, the casein dilactate, the chief constituent of cottage cheese, is more digestible by pepsin in the presence of free hydrochloric acid than is paracasein monolactate, the principal nitrogenous constituent of Cheddar cheese; second, cottage cheese is in such a mechanical condition that it admits of easier attack by digestive agents than does new Cheddar cheese."

The details of the methods which were found most practical in the manufacture of cottage cheese are also summarized. The commercial value of cottage cheese depends primarily upon its flavor, which, it is stated, should be of mildly soured or properly ripened cream, and upon its texture, which should be smooth and free from harshness.

The manufacture of cheese with pasteurized milk, G. FASCETTI (*Staz. Sper. Agr. Ital., 36 (1903), No. 10–12, pp. 1004–1008*).—From the experiments reported in this paper it is concluded that the use of pasteurizd milk in the manufacture of cheese makes it necessary to allow more time for ripening than is required when untreated milk is used. The use of fluid extract of a half-ripe cheese of the same sort exercises a marked influence on pasteurized milk and makes it possible to obtain excellent products. When pasteurized milk is used a somewhat larger quantity of cheese is obtained per 100 parts of milk.

A comparison of the bacterial content of cheese cured at different temperatures, F. C. HARRISON and W. T. CONNELL (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), No. 20–22, pp. 637–657*).—This has been noted from another source (E. S. R., 15, p. 717).

Report of a conference of dairy instructors and experts at the Department of Agriculture, Ottawa, November 4, 5, and 6, 1903 (*Ottawa: Govt. Printing Bureau, 1904, pp. 128*).—Among the subjects discussed at this conference were the cooperation of dairy farmers, export trade in dairy products, the preservation and safe transportation of dairy products, common defects in butter and cheese, the syndicate system in Ontario and syndicate inspectors, milk testing, aeration and cooling of milk for cheese making, sanitation of cheese factories and creameries, pasteurization in butter making, and the cold curing of cheese. In an appendix are given suggestions for the prevention of mold on butter and directions for the determination of acidity in milk.

VETERINARY SCIENCE AND PRACTICE.

Modern theories of immunity and vaccination, L. PFEIFFER (*Ztschr. Hyg. u. Infectionskrank., 43 (1903), No. 3, pp. 426–462, figs. 11*).—A description is given of the various bodies which have been assumed to be present in the serum in accounting for infection, vaccination, and immunity. Notes are given on bacterial immunity and immunity against Protozoa.

The intracellular toxins of certain micro-organisms, A. MACFADYEN and S. ROWLAND (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 4, pp. 415, 420*).—Brief notes are given on the nature and methods of demonstrating the intracellular toxins of *Staphylococcus pyogenes aureus*, *Bacillus enteritidis*, and the tubercle bacillus.

The influence of certain bacteria on the coagulation of the blood, L. Loeb (*Jour. Med. Research, 10 (1903), No. 3, pp. 407–419*).—Most of the experiments reported in this paper were made in vitro, the plasma of goose blood being subjected to various organisms, including coli bacillus, tubercle bacillus, etc. In a series of small sterilized porcelain dishes 3 to 18 drops of a bouillon culture of the organisms to be tested were mixed with 3 cc. of diluted plasma of goose blood. It was found that the results thus obtained were approximately constant. *Staphylococcus pyogenes aureus* was found to possess the greatest coagulating power, while very little such power was observed in tubercle bacillus.

The principles and conditions of the control of epizootics, W. Nagorsky (*Fortschr. Vet. Hyg., 1 (1904), Nos. 10, pp. 277–280; 11, pp. 301–306, dgms. 4*).—A historical account is given of the theories upon which repressive measures against various animal plagues have been based. In this discussion especial attention is given to the more important infectious diseases, such as anthrax and rinderpest.

General views on the etiology of infectious diseases; hygiene and serum researches; tuberculosis, F. Hueppe (*London: Baillière, Tindall & Cox, 1904, pp. 39*).—These three subjects were discussed by the author during the presentation of the Harben lectures at King's College, London, 1903. In the first lecture a general account was given of the problems of immunity and susceptibility to disease from the standpoint of modern theories and investigations. In the second lecture the author discussed the results obtained by experiments with various investigators in the treatment and prevention of infectious diseases by means of serum inoculations. The various complex bodies of immune and normal sera were described in detail.

In a discussion of tuberculosis the author called attention to the great importance of this disease in human and veterinary pathology and discussed the means by which the disease can be controlled in man and also the methods by which intertransmission may be prevented.

A study of infection through the navel, Kabitz (*Ztschr. Thiermed., 7 (1903), No. 3–4, pp. 251–274, figs. 4*).—The importance of infection of young animals through the umbilical cord is briefly discussed. The author found that infection by this means could take place as the result of the attack of streptococci, staphylococci, coli bacilli, etc. Various forms of nephritis are caused by infection through the navel. Notes are also given on the importance of this source of infection in meat inspection and on the desirability of making a thorough examination of the umbilical cord in the inspection of meat.

Annual report of the imperial bacteriologist for the year 1902–3, A. Lingard (*Calcutta: Supt. Govt. Printing, India, 1902, pp. 23*).—A report is made on the experiments which have thus far been carried out by the author in the control of rinderpest, anthrax, dourine, hemorrhagic septicemia, Texas fever, etc.

It was found that the mucoid material in the bile of cattle and buffalo is a nucleo-proteid, which rapidly increases in quantity after the animals are injected with virulent rinderpest blood. In cattle inoculated simultaneously with protective serum and virulent blood the nucleo-proteid begins to increase on the day after inoculation. The same substance may be precipitated from the bile of animals affected with rinderpest. An active immunity to the disease begins to be developed on the fifth day after injection with virulent bile, but a passive immunity is manifested immediately after inoculation.

Detailed notes are given on methods of preparing protective serum and the results obtained from its use. During the year covered by the report 87,791 doses were issued, and as a general rule excellent results were obtained from its use.

Live-stock sanitation in Arkansas, R. R. Dinwiddie (*Arkansas Sta. Bul. 82, pp. 97–106*).—Copies are given of Arkansas laws relating to the protection of horses, mules, jacks, and jennets against contagious diseases, and a discussion is presented regarding Federal regulations on shipment of cattle from Arkansas and the laws of

Oklahoma, Kansas, Missouri, and Indian Territory which affect the shipment of cattle from and into Arkansas.

Report of inspectors of stock for the year ended March 31, 1903, T. A. FRASER ET AL. (*New Zealand Dept. Agr. Rpt. 1903, pp. 94–189*).—Detailed reports are presented for various inspectors in different parts of New Zealand regarding the condition of grazing lands and pastures and the prevalence of diseases in different farm animals. Notes are also given on slaughterhouse inspection, the destruction of injurious mammals and birds, the inspection of milk in dairies, and other related topics.

Veterinary, sanitary, and zootechnical problems of the Steppes, A. I. KASATKIN (*Arch. Vet. Nauk, St. Petersburg, 33 (1903), Nos. 11, pp. 1160–1200; 12, pp. 1326–1357*).—Notes are given on the most important diseases which prevail among domestic animals in the regions of the Russian Steppes, and also on the various problems of breeding and care of these animals.

Interstate veterinary conference (*Agr. Jour. Cape Good Hope, 24 (1904), No. 1, pp. 81–90*).—A conference was held November 4–6, 1903, at Bloemfontein, at which representatives of all the British South African States, German South West Africa, and Portuguese East Africa were present, for the purpose of discussing measures calculated to suppress animal diseases in South Africa.

D. Hutcheon spoke on the subject of pleuro-pneumonia and rinderpest. In the discussion regarding these diseases Koch stated his opinion as being that immunity against rinderpest was best accomplished by the use of pure serum. Other speakers agreed with Koch, but Flintoff referred to satisfactory experience which he had had in Orange River Colony in the use of bile. Dr. Koch also presented an account of the African Coast fever. In the discussion of this trouble A. Theiler argued that this disease would probably be confined to the areas in which ordinary Texas fever is at present found. A resolution was adopted to the effect that the different governments of South Africa be requested to collect information and conduct experiments with regard to the possibility of exterminating ticks.

The subject of sheep scab was also discussed by Woollatt, Hutcheon, Tooke, and others. Hutcheon defended the use of the lime-sulphur dip, which he stated possessed an efficacy superior to that of most dips.

The imperial law concerning food animals and meat inspection of June 3, 1900, with related decrees of the Federal Council (*Das Reichsgesetz Betreffend die Schlachtvieh- und Fleischbeschau. Berlin: Carl Heymann, 1903, pp. 381*).—A copy of the text of the German imperial meat inspection law is given, together with various decrees of the Federal Council by which the different sections of the law were put in force and recent decisions of Prussian authorities regarding the execution of the law in the control of meat traffic and animal diseases.

Necrosis as the result of Bacillus necrophorus, H. A. VERMEULEN (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 3, pp. 102–111*).—The literature of this subject is briefly discussed. The author presents detailed clinical notes on a number of cases which came under his observation. In 1 case in a cow the liver was extensively affected with the process of necrosis, while all other organs were found to be in a normal condition. Notes are also given on the occurrence of *Bacillus necrophorus* in cases of quittor and a brief account is given of the biology of the necrosis bacillus.

Gangrenous broncho-pneumonia caused by the awns of grasses, DUBOIS (*Rev. Vét. Toulouse, 28 (1903), No. 9, pp. 542–545*).—In a number of cases of broncho-pneumonia which were characterized as gangrenous and evidently developed from small foci the author found that the means of infection was furnished by punctures produced by the awns of *Hordeum murinum*.

Hair balls in sheep, J. A. VOELCKER (*Analyst, 28 (1903), No. 330, p. 263, figs. 2*).—From 1 to 50 hair balls were found in the first stomach of lambs and in some cases caused death. A microscopical examination showed that these balls were aggregations of the soft downy hairs which are found mainly on the florets.

The action of the poisonous principle of Equisetum hyemale, MATZ and LUDEWIG (*Ztschr. Veterinärk., 15 (1903), No. 2, pp. 49–54*).—The authors' experiments showed that the poisonous principle of Equisetum was apparently neither an alkaloid nor glucosid, but was aconitic acid. This acid, obtained free, caused the death of guinea pigs to which it was fed, and was also shown to be poisonous for horses.

Tuberculosis; its nature, distribution, cause, and prevention, W. SCHUMBURG (*Die Tuberkulose, ihr Wesen, ihre Verbreitung, Ursache, Verhütung und Heilung. Leipzig: B. G. Teubner, 1903, pp. 139, pl. 1, figs. 8*).—A general account is given of the nature of tuberculosis, its various clinical forms in man and animals, the distribution of the disease, and the means of infection. Particular attention is given to sanitary regulation of tuberculous human patients, the control of tuberculosis among cattle, and the proper treatment of tuberculous meat and milk.

The passage of tubercle bacilli through the normal intestinal wall, M. P. RAVENEL (*Jour. Med. Research, 10 (1903), No. 3, pp. 460–462*).—The author selected healthy dogs and fed them upon an emulsion of equal parts of melted butter and warm water containing numerous tubercle bacilli. The dogs were killed 3½ or 4 hours after feeding, and the chyle was collected for examination. The mesenteric glands were also examined. No lesion was observed in any case in the alimentary tract. Tubercle bacilli, however, were found in the chyle or mesenteric glands of all 10 dogs upon which experiments were made.

As a result of these experiments the author concludes that, at least under certain conditions, tubercle bacilli may readily pass through the normal intestinal wall and infect the animal without causing any lesion in the alimentary tract.

Cerebral tuberculosis in heifers, C. BESNOIT (*Rev. Vét. Toulouse, 28 (1903), No. 8, pp. 465–472*).—Detailed notes are given on the symptoms and pathological anatomy of a case of tuberculosis in a heifer in which the meninges of the brain and other cerebral structures were affected.

The immunization of young cattle against tuberculosis, THOMASSEN (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 1, pp. 5–19*).—The literature of this subject is briefly reviewed, with special reference to the experiments of von Behring. In the author's experiments a number of young cattle were used and were inoculated intravenously with tubercle bacilli of human origin. Detailed notes are given on a series of 5 experiments. From these experiments the author concludes that cattle endure intravenous inoculations of human tubercle bacilli in doses of 30 mg. The first inoculation does not produce any reaction until after 10 to 15 days, while the second and third injections produce an elevation of temperature within 24 hours. The author is not disposed to draw definite conclusions from his experiments regarding the practical value of this method of immunization.

Protective vaccination for tuberculosis, M. SCHLEGEL (*Berlin. Tierärztl. Wchnschr., 1903, No. 49, pp. 745–750*).—A test was made of the efficacy of von Behring's method in immunizing cattle against tuberculosis (E. S. R., 14, p. 393). Two immunized cattle were obtained from the Marburg Institute and the results obtained from inoculation of these cattle were compared with the effects of inoculation of 3 control cattle. In the first experiment the immunized cattle and 1 control animal were used and it was found by tuberculin injections that the 2 immunized cattle were still affected by tuberculosis. All 3 animals were inoculated with virulent material obtained from the lymphatic glands of a tuberculous beef animal. Inoculations of guinea pigs with this material showed that the tubercle bacilli were exceedingly virulent. During the first 3 weeks after inoculation no reaction was shown in any of the animals. After that time, however, in the control animal a considerable elevation of temperature and other symptoms of infection were observed. A tuberculin test made 9 weeks after inoculation produced a decided reaction in all 3 animals.

These 3 animals were then subjected to a second inoculation with virulent material and the results were compared with the effect of similar inoculation in 2 healthy

control cattle. The material used for inoculation was exceedingly virulent. Only the slightest febrile reaction was observed in the immunized animals and 1 of the control animals. In the other 2 control animals a considerable rise of temperature was noted. Detailed notes are given on other symptoms which were observed during the course of the experiment. All 5 animals were killed and carefully examined. The results of these post-mortem examinations showed that all of the animals were affected to some extent with tuberculosis.

The author believes that it is impossible to state, on the basis of experiments thus far carried out, whether von Behring's method can be applied without harmful results in all cases or not. The immunized animals, however, showed an almost complete resisting power toward injections with virulent material, and the author concludes that this method must be considered as of great value and promise in the control of tuberculosis in cattle.

The cure of tuberculosis as the keystone of the problem of combating bovine tuberculosis, E. Hauptmann (*Ztschr. Thiermed., 7 (1903), Nos. 3-4, pp. 161-200; 5-6, pp. 321-357*).—In the author's opinion the unity of human and bovine tuberculosis must be assumed as a demonstrated fact. Attention is therefore called to the great importance for animal industry of securing any method of treatment which can be relied upon to cure the disease in man and animals.

A critical historical review is presented on the literature of this subject in connection with a bibliography of 302 titles. In this discussion the opinions of various investigators regarding the possibility of curing tuberculosis in man or animals are quoted, and notes are given on the formulas which have been recommended in the preparation of medicines to be used for this purpose. While various preparations of silver have yielded encouraging results, the author considered that iodin was more promising, and in the use of various forms of this drug finally experimented with a preparation recently put upon the market under the name Iodipin. This remedy may be used in the treatment of tuberculosis in cattle, either by hypodermic injections or by way of the mouth.

The author made experiments on cattle during which Iodipin was repeatedly injected under the skin. No irritation, inflammation, or infiltration was observed. The drug remains sterile and there is therefore no necessity of sterilizing the inside of hypodermic syringes after treating experimental animals. Numerous experiments were also made during which cattle were fed varying quantities of Iodipin. In the first experiment a tuberculin reaction was obtained in animals which had been treated with Iodipin, but the tuberculous foci gave evidence of being gradually walled in by connective tissue and of becoming less virulent. It was found by further experiments in the subcutaneous use of Iodipin that this drug could be administered to cattle in daily doses of 50 gm. without producing any injurious effects upon the experimental animals. The largest dose which was administered was 600 gm., and this had no bad effects upon the animal. In 4 tuberculous animals subjected to repeated doses of Iodipin no tuberculin reaction was obtained when they were tested later, and an examination of the animals indicated that they were apparently cured.

This method of treating tuberculosis in cattle is compared with the methods proposed by Bang, von Behring, Ostertag, and others, and the advantages and disadvantages of the various methods are discussed in considerable detail. The author believes that his method possesses many advantages over all other methods, and is to be preferred in combating tuberculosis in cattle. The author suggests that his method be tested on a large scale for the purpose of determining its practicability.

Tuberculin tests in western Norway, C. Lekknes (*Norsk. Vet. Tidsskr., 16 (1904), No. 1, pp. 1-7*).—A brief account is given of the tuberculin tests which have been made during recent years in western Norway, with notes on the prevalence of tuberculosis as indicated by these tests.

The utilization of the meat of tuberculous animals in Germany, Kopp (*Rec.

Gén. Méd. Vét., *2 (1903), No. 22, pp. 513–518*).—The laws and regulations of Germany relating to this matter are briefly discussed, and the regulations are compared with those which exist in France with regard to the disposal of tuberculous meat. It is urged that greater attention should be given to this matter in order that a greater uniformity of treatment may be brought about, and also in order that dangerous meat may more certainly be excluded from the market.

A specific enteritis in cattle apparently of a tuberculous nature, H. MARKUS (*Tijdschr. Veeartsenijk. Maandblad, 30 (1903), No. 5, pp. 195–206*).—Detailed clinical notes are given on an enteritis observed in cattle. In cases of this disease a diffuse chronic infiltration was observed in the alimentary canal, involving mucous and submucous layers. The mesenteric lymph glands were also affected in a manner apparently identical with tuberculosis of these structures.

Disease of cattle in the Molteno District (*Agr. Jour. Cape Good Hope, 24 (1904), No. 2, pp. 163–165*).—A preliminary investigation was made regarding the nature and cause of a disease of cattle in the Molteno District of South Africa. The disease affects cattle of all ages, but chiefly old cows. It does not appear to be due to an active plant poison, but some evidence was obtained which indicates the possibility of a slow-acting plant poison. According to this hypothesis the disease would be related to the cirrhosis of the liver which is supposed to be caused by eating *Senecio jacobæa*.

An investigation of calf diarrhea, E. JOEST (*Ztschr. Thiermed., 7 (1903), No. 5–6, pp. 377–413*).—The observations and experiments reported in this paper were confined to the Province of Pomerania. A large number of calves were obtained for examination, all of which were submitted with the statement that they were affected with diarrhea. Among these calves a bacteriological examination showed that 20 were affected with diarrhea, 1 with polyarthritis, 1 with hemorrhagic enteritis, and 1 with catarrhal pneumonia.

An examination of the lesions in cases of calf diphtheria showed that the most essential pathological characteristics of this disease are catarrhal inflammatory phenomena in the stomach and alimentary tract, inflammatory swelling of the corresponding lymph glands, parenchymatous degeneration of the liver, kidneys, and heart, and hemorrhages in the serous membranes. A bacterial organism was found in the small and large intestines, spleen, and blood. This organism was grown in pure cultures on various media, and inoculation experiments were made upon guinea pigs, mice, rabbits, and calves. The results of these experiments are presented in detail.

It was found that the development of calf diarrhea could be to some extent prevented by allowing the calf to have the fresh cow's milk immediately after birth. It was shown, however, that the disease could develop in calves within a period of from 12 to 15 hours without any infection having taken place through the alimentary tract; in such cases the infection took place through the umbilical cord. A comparison of the bacterial cultures convinced the author that the bacteria of calf diphtheria described by Jensen, the virulent coli bacilli of Poels, and the organism isolated by the author are all one and the same species. This organism is also identical in all essential particulars with the common coli bacillus, its one distinguishing character being its greater virulence for calves. The author therefore proposes the name coli bacillus of calf dysentery for this organism.

Immunizing experiments with rabbits showed that it is a simple matter, by means of increasing doses of this organism, to obtain a strongly agglutinating serum. Experiments with this protective serum, however, showed that it is effective only against bacilli belonging to the same race, while against organisms coming from any other culture it is almost entirely inactive. In preparing a protective serum, therefore, the author recommends that a large number of cultures of coli bacilli should be mixed so as to obtain a polyvalent serum.

Spotted kidney in calves, its histological nature, J. BASSET (*Rev. Gén. Méd. Vét., 2 (1903), No. 23, pp. 582–588, figs. 2*).—The histological pathology of this disease is described in detail. As a result of this study the author reaches the conclusion that spotted kidney of calves is characterized by inflammatory lesions of an acute nature, which may terminate in suppuration or in the development of a chronic condition. The etiology of the disease is not understood.

Contagious pleuro-pneumonia, CONSTANT and MESNARD (*Rec. Méd. Vét., 8. ser., 10 (1903), Nos. 13, pp. 436–444; 17, pp. 569–573*).—The authors present in a tabular form the prevalence and fatality of pleuro-pneumonia in various parts of France and also give an account of inoculation experiments which were undertaken for the purpose of determining the period of incubation and other important matters concerning this disease.

A test was made of a method of preventive inoculation from which considerable success was had, although a number of the animals thus treated died without the ordinary lesions of the disease in the lungs. The authors conclude from their experiments that the accidents which follow the use of preventive inoculation are observed chiefly in animals in a state of latent infection. It is believed that the results obtained throw new light upon the importance of latent infection in general. Pure cultures of a known virulence may be used in inoculating healthy animals and animals in a state of latent infection, and the results thus obtained may be readily compared.

The authors believe that preventive inoculation may reveal the fact of latent infection in animals thus treated, and that this inoculation appears to bring about a localization of the virus in vaccinated animals. The duration of immunity produced by the first inoculation is at least 10½ months.

Parturient paresis, F. W. VAN DULM (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 3, pp. 111, 112*).—According to the author's experience the most effective treatment consists in increasing the pressure within the mammary gland. This may be done by injections of potassium iodid or other fluid, or by insufflation of air.

The recurrence of parturient paresis, A. J. WINKEL (*Tijdschr. Veeartsenijk. Maandblad, 30 (1903), No. 6, pp. 256–258*).—A brief account is given of the occurrence of parturient paresis in a cow which had recovered from an attack of the disease a short time before and about 3 days after parturition.

The etiology and treatment of parturient paresis, CAILLIBAUD (*Rev. Vét. Toulouse, 28 (1903), No. 7, pp. 420–428*).—The author attempts to reach a reasonable hypothesis regarding the nature of this disease. The Schmidt treatment was used by him for 2 years with excellent results. Warm applications to the udder and friction along the vertebral column were also found to exercise a beneficial influence. From the fact that the injection of liquid or air into the udder produces good results in the cure of this disease, the author concludes that parturient paresis is due to toxins set free in the udder as the result of increased metabolism. The pressure of the liquid or air in the udder is believed to check the physiological processes and consequently reduce the amount of toxin.

Clinical notes on parturient paresis, E. NAUDINAT, Jr. (*Rev. Vét. Toulouse, 28 (1903), No. 5, pp. 262–267*).—In some cases of this disease the author applied friction together with treatment with mustard in the lumbar region, while stimulants were administered by way of the mouth. The best results were obtained from the use of Schmidt's method followed by the insufflation of air into the udder. In the use of this combined treatment the author produced complete cure in 95 per cent of cases.

The use of air in treating parturient paresis, EGGMANN (*Schweiz. Arch. Tierh., 45 (1903), No. 1–2, pp. 52–55*).—In the author's experience the results obtained in treating this disease by means of infusions of potassium iodid were not very satisfactory. Much better results were had from the use of air.

Treatment of parturient paresis with oxygen, KNÜSEL (*Schweiz. Arch. Tierh., 45 (1903), No. 1–2, pp. 56–59, figs. 3*).—Descriptions are given of a number of forms of apparatus which in the author's experiments have been found convenient for use in carrying oxygen and administering it in cases of parturient paresis. Considerable difficulty is naturally experienced in transporting sufficient oxygen for use in country practice. Excellent results have been obtained from the application of this method.

Treatment of parturient paresis during the past five years, J. SCHMIDT (*Rev. Vét. Toulouse, 28 (1903), No. 1, pp. 1–16*).—The author describes his method of treatment of this disease and the theory upon which it was based. Good results were obtained by this method, but recently a double treatment has been preferred consisting of first an injection of iodid of potash, later of insufflation of air.

According to the author's experiments the results from this treatment are manifest within ¼ hour, especially in cases where coma was present before the treatment was begun. Among 51 cows treated by this method, 48 have recovered after application in from 1 to 16 hours, the average period required for recovery being 5 hours.

Differential diagnosis of parturient paresis and apoplectic purpureal septicemia, E. H. B. GRAVENHORST (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 2, pp. 81–84*).—Frequently the symptoms of these two diseases are so similar as to lead to confusion. As a rule, however, the temperature in septicemia does not show a tendency to become subnormal as in cases of parturient paresis.

The bacteria concerned in mammitis of cows and goats, P. STEIGER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1903), No. 3, pp. 326–341; 35 (1904), Nos. 4, pp. 467–484; 5, pp. 574–593*).—An elaborate study was made of acute and chronic forms of mammitis in cows and goats. Most of the material came from cows. The literature of this subject is discussed in connection with a short bibliography. Notes are given on the various forms assumed during the development of mammitis, and the organisms obtained from the milk of infected animals were identified and cultivated on a nutrient media.

Among the organisms found in these cases mention may be made of *Staphylococcus mastitidis*, *Galactococcus fulvus*, *Streptococcus mastitidis*, coli bacillus, and *Bacillus ærogenes*. The last two named organisms resemble each other very closely, biologically and morphologically, and their peculiar characters are therefore described in detail. Many cases of mammitis were found to be caused by mixed infection in which several organisms participated.

With regard to the origin of infection in cases of mammitis considerable difference of opinion has prevailed, and experiments were undertaken by the author for the purpose of obtaining evidence concerning this point. Negative results were obtained in all cases from rubbing bouillon cultures of coli bacillus upon the teats of healthy cows. Neither the mammary gland nor the milk secretion was altered in any way. The author concludes, therefore, that this is not the usual method of infection. The theoretical possibility of infection by means of the lymphatic system is conceded, but it is urged that this can not be the usual means of infection. Apparently the most probable method of infection in this disease is through the blood system.

An enzootic occurrence of acute streptococcic mammitis, P. DUBOIS (*Rev. Vét. Toulouse, 28 (1903), No. 13, pp. 789–796*).—The author calls attention to the importance of this disease on account of its great infectiousness, the number of animals affected, and the lack of satisfactory treatment. An especially acute outbreak occurred and was investigated by the author, with the result that *Streptococcus conglomeratus* was found to be the pathogenic organism of the disease. The outbreak spread rapidly in spite of the most severe measures of disinfection. Notes are given on the behavior of the organism on various culture media.

Operative treatment of anomalies of the teats, HUG (*Schweiz. Arch. Tierh., 45 (1903), No. 5, pp. 224–237, fig. 1*).—The author describes the various practical

methods which have been devised for enlarging the opening in teats which are pathologically altered, and in the treatment of various other anomalies of these organs.

The study of parasitic diseases of the blood, especially malaria in cattle and man, E. JACKSCHATH (*Berlin. Tierärztl. Wchnschr., 1903, No. 50, pp. 769–776*).—The author reviews in a critical manner some of the more important contributions to a study of Texas fever in cattle and malaria in man. The life history of the blood parasite of Texas fever is described in considerable detail with special reference to the theoretical explanation of immunity toward this disease. The author concludes that natural or acquired immunity toward Texas fever is due to the presence of asexual degenerated forms of the blood parasite.

The piroplasmoses of cattle, E. DSCHUNKOWSKY and J. LUHS (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 4, pp. 486–492, pls. 3*).—According to the authors, piroplasmosis in Russia appears under 3 forms, the first of which is observed in northern Russia, the second in Ciscaucasia, and the third in Transcaucasia. The form which occurs in Transcaucasia is called tropic piroplasmosis, and is characterized by the development of extensive hemorrhages in all organs of the body. The blood parasites observed in cases of this disease occur in the form of cocci, rings, and bacilli. Immunization experiments have not given satisfactory results, and the agency of ticks in the distribution of the disease has not been definitely proved.

Piroplasmosis of the donkey, T. H. DALE (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 187–195*).—This disease occurred in a serious outbreak in Lydenburg. The period of incubation was not definitely determined, but the symptoms were similar to those in equine malaria.

Inoculation experiments with virulent blood from donkeys caused no reaction or serious disturbance in dogs, rabbits, mules, or donkeys. These experiments indicate that the disease is not easily transmitted in this manner until after the blood parasite has undergone a series of metamorphoses. The disease yields readily to medicinal treatment, and prognosis is therefore considered favorable unless the animal has suffered for some time before treatment is begun. In the first stages of the disease ammonium carbonate in 2-gm. doses is recommended, followed by arsenic in doses of 3 gr. in 1 gm. of sulphur after the fever abates.

The cultivation of Trypanosoma brucei, F. G. NOVY and W. F. MCNEAL (*Jour. Amer. Med. Assoc., 41 (1903), No. 21, pp. 1266–1268*).—The results of the experiments made by the authors in devising suitable means for cultivating the parasitic organism of nagana are briefly described. *T. brucei* as found in the blood of infected animals is exceedingly virulent, and intraperitoneal injection of virulent cultures is sufficient to kill mice and rats in 7 or 8 days. Experiments in immunizing laboratory animals against nagana have not thus far yielded final results. Apparently a slight protection was afforded by vaccination. Attention is called to the differences between *T. brucei* and *T. lewisi*.

A trypanosoma disease of North Africa, RENNES (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 18, pp. 424–430*).—During the first months of the year the author observed a disease among horses which was apparently due to infection with a Trypanosoma. The blood parasite appears to differ from that of dourine. The symptoms and course of the disease are described in detail. Considerable fever is present and acute nervous symptoms are noted together with hematuria. The organism is described and notes are given on its morphology. In the author's experiments it was found to be pathogenic for the gray mouse, the jerboa, and the dog.

African coast fever, R. KOCH (*Agr. Jour. and Min. Rec. [Natal], 6 (1903), No. 20, pp. 734–742*).—This is the author's third report concerning his investigations on African coast fever. It has been found that a mild infection may be produced by repeated injections of blood from sick or recovered animals. The severity of infection thus produced is not increased by repeated passages through various animals.

In the author's investigations 3 distinct lines of experiments were undertaken for the purpose of devising immunizing and curative methods. A number of animals were subjected to inoculation with the blood of sick or recovered animals. It was found that as good results were obtained from the use of the blood of recovered animals as with blood taken from animals during the progress of the disease. During these experiments many cases of undoubted immunity were established.

In a second series of experiments healthy and sick animals were treated with doses of serum obtained from immunized animals. This serum exercised a remarkable effect upon the blood parasites, causing them to shrink and disappear. The serum treatment, however, while possessing this great advantage, is subject to one serious disadvantage, viz, that the serum exercises a pronounced hemolytic effect upon the blood of diseased cattle. An injection of 50 cc. of serum in a sick animal is sufficient to cause death by hemolysis. Considerable success was had in using the serum method on healthy animals for the purpose of preventing the development of the disease.

In a third series of experiments a test was made to determine the existence of natural immunity in various races of cattle. It was found that zebus and half-bred zebu cattle had no natural immunity toward African coast fever; on the other hand, cattle coming from German East Africa appeared to be perfectly immune. As a general result of the author's investigations inoculation with the blood of recovered animals is recommended as the most effective and most feasible means of controlling this disease.

A contribution to the diagnosis of heart water in cattle, A. Theiler (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 163–173, pl. 1*).—The symptoms of heart water in sheep and goats are described in detail, together with an account of the post-mortem lesions of this disease, its geographical distribution, and occurrence in cattle. Experiments indicate that the incubation period in cases of tick infection is longer than in cases of injection with virulent blood. The disease may be transmitted by inoculating the virulent blood of sheep and goats into cattle. Under natural conditions the disease is carried by bont ticks in a nymphal or adult condition.

The Texas cattle fever: How science is winning a long fight, C. S. Potts (*Amer. Mo. Rev. of Reviews, 29 (1904), No. 168, pp. 49–55, figs. 11*).—A brief historical account is given of the traffic in Texas cattle, which were driven over the trail from the South into Kansas and Missouri during the period from 1867 to 1887. Notes are also given on the quarantine line, the nature and transmission of Texas fever, the method of inoculation with the blood of recovered animals, and the benefits of this discovery to the stock interests of the South.

The cattle tick and the quarantine restrictions, T. Butler (*Bul. North Carolina State Bd. Agr., 24 (1903), No. 10, pp. 30–37*).—The author presents a general description of the quarantine line and the restriction of federal quarantine upon the cattle of North Carolina. It is argued that, while these restrictions are necessary, they cause considerable loss to animal industry in the State. Detailed recommendations are given regarding methods of destroying the cattle ticks.

The classification and nomenclature of diseases known under the name actinomycosis, J. Lignières and G. Spitz (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1903), No. 3, pp. 294–308; 35 (1904), No. 4, pp. 452–458*).—In an extended study of actinomycosis it was found desirable to classify the organisms found in cases of this disease into 3 groups, viz., *Actinomyces bovis*, *Streptothrix israeli*, and Actinobacillus. The behavior of these organisms on various culture media is described in detail and notes are given on the results of inoculation experiments in laboratory animals and a study of the virulence of the different organisms.

The authors conclude that actinomycosis can no longer be considered as a simple disease due to 1 organism, but that some classification must be adopted based on the morphological, cultural, and pathogenic properties of the micro-organisms which cause the various forms of the disease.

A study of dourine, J. ROUGET (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 3, pp. 81–90*).—This article consists largely of a critical review of the results thus far obtained in a study of the symptoms, pathological anatomy, and etiology of this disease.

The treatment of dourine by cacodylates, E. MARCHAL (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 7, pp. 230–232*).—The author describes a number of experiments made in treating dourine by the salts of cacodylic acid. In the first experiments of the author, cacodylate of iron was used in subcutaneous injections. Lesions were produced in the skin, however, and later this remedy was abandoned and cacodylate of soda was used in its place. The latter remedy was injected subcutaneously in daily doses of 1 gm. Notes are given on 6 cases in which this remedy was used, and excellent results were obtained in all except 1 case in which the treatment was not begun until 132 days after infection.

Blackleg and vaccination, N. S. MAYO and C. L. BARNES (*Kansas Sta. Bul. 122, pp. 163–178, figs. 6*).—In the authors' experience blackleg is apparently confined to cattle. Only 1 case was reported of its appearance in sheep and this was considered doubtful. Reports from 1,656 stock men indicate that the greatest losses from blackleg occur in May, June, September, and October. While blackleg is generally supposed to be transmissible by wound infection, the evidence thus far obtained does not seem to favor this theory. The authors' experiments and observations on this disease indicate that the greatest loss in cattle occurs between the ages of 6 to 18 months, and that fat calves are most susceptible. The average loss among unvaccinated calves is between 4 and 5 per cent, while after vaccination it is 0.4 per cent.

The minute structure of the anthrax bacillus, D. OTTOLENGHI (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 5, pp. 546–553, figs. 3*).—The author studied the anthrax bacillus from material obtained by means of pure cultures and in the blood or exudations of infected animals. The organism was stained by various methods and subjected to different reagents for the purpose of differentiating its finer structures. These structures are described in detail. According to experiments carried out by the author it is possible to stain living anthrax bacilli with neutral red without destroying their germinating power.

The period of life of anthrax spores, A. VON SZÉKELEY (*Ztschr. Hyg. u. Infectionskrank., 44 (1903), No. 3, pp. 359–363*).—Notes are given on the results of an examination of anthrax cultures which had been kept in laboratories for long periods. It was found that in gelatin media which had been inoculated with the spores of anthrax bacilli and maintained at the temperature of a living room, exposed to diffuse light and under conditions which favor moderately rapid desiccation virulent spores were found after a period of 18½ years that were still capable of germinating and were virulent, at least for white mice. Under the same conditions the spores of the bacillus of malignant edema also retained their vitality for the same length of time. It was found also that the spores of these 2 species of bacilli could be maintained together in one culture for 18½ years without either species of organism being influenced to any noticeable degree.

Preliminary note on the resistance to heat of Bacillus anthracis, A. MALLOCK and A. M. DAVIES (*Proc. Roy. Soc. [London], 72 (1903), No. 486, pp. 493–499, fig. 1*).—The experiments reported in this paper were undertaken for the purpose of determining the degree of heat and period of exposure necessary for the destruction of anthrax bacilli and spores. A special apparatus was constructed for these experiments, and a detailed description of the apparatus is given. The anthrax bacilli used in these experiments were contained in infected water in sterilized glass tubes 3 in. long and ½ in. in diameter. Care was taken that spores were present in all cases.

During the experiments 113 tests were made, of which 95 were at temperatures above and 18 below 100° C. In the 95 experiments at temperatures above 100°, 14

cases occurred in which some growth took place after incubation of the tubes; in 12 of these 14 cases, however, the growth was contaminated. In the 18 experiments made at temperatures below 100° C., growth occurred in 5 cases, in only 1 of which a pure anthrax culture was found. The authors conclude from their experiments that the subjection of anthrax spores to a temperature of 100° or higher, even for the shortest possible period, is sufficient to insure their destruction.

The treatment of anthrax in cattle, M. STREBEL (*Schweiz. Arch. Tierh., 45 (1903), No. 3, pp. 105–113*).—The literature of this subject is briefly discussed and the usual prophylactic measures are described. While considerable success may be expected in the prevention of the disease by the adoption of strict antisepsis and the use of the vaccination method, little hope may be entertained of good results from the ordinary treatment of anthrax. Carbolic acid has been recommended for use in intravenous injections and was tried by the author without very satisfactory results. In 4 cases the exposure of the affected animals to a very low temperature appeared to have striking results in bringing about a cure.

Anthrax vaccination according to Sobernheim, KUNZE (*Berlin. Tierärztl. Wchnschr., 1903, No. 52, pp. 798, 799*).—Brief notes are given on successful results obtained from vaccinating cattle and horses against this disease.

Effect of anthrax vaccination on the severity of foot-and-mouth disease, DELHAYE (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 10, pp. 235–237*).—Statistics are presented with reference to infection with foot-and-mouth disease in animals which have previously been vaccinated for the purpose of preventing anthrax. These statistics show that animals thus treated are unusually resistant to foot-and-mouth disease, and it is believed by the author and by Nocard, who joined in the discussion, that the anthrax vaccination apparently exercises a favorable influence in preventing the development of foot-and-mouth disease.

Transmission of foot-and-mouth disease from animals to man, A. CONTE (*Rev. Vét. Toulouse, 28 (1903), No. 5, pp. 249–262*).—This paper is based partly on replies to a circular letter of inquiry regarding the transmission of foot-and-mouth disease from animals to man, the means of transmission, the localities where the disease exists, number of cases observed, and duration of the disease. Incidentally observations were made on the difference in susceptibility of various domestic animals to this disease. It was concluded that as a rule man becomes infected with foot-and-mouth disease through drinking the milk of infected animals.

The transmission of foot-and-mouth disease to man, H. ROCHÉ (*Rev. Vét. Toulouse, 28 (1903), No. 4, pp. 185–194*).—Attention is called to the danger from drinking the milk of animals affected with this disease. It is argued that more attention should be devoted to the determination of the nature and forms of stomatitis in cattle.

Sheep poisoning at the Hawkesbury Agricultural College, H. W. POTTS (*Agr. Gaz. New South Wales, 14 (1903), No. 12, pp. 1212–1214, fig. 1*).—A number of sheep died suddenly with symptoms of poisoning. A post-mortem examination of these animals failed to reveal any constant set of lesions. The evidence obtained from a study of this outbreak indicated that *Sisyrinchium micranthum* was the cause of the poisoning.

Infectious broncho-pneumonia in lambs, G. MOUSSU (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 3, pp. 90–95*).—A description is given of the symptoms, diagnosis, lesions, prognosis, and treatment of this disease. No remedy has been found which produces a certain cure. The best results are to be obtained by observing strict prophylactic measures, especially in avoiding the importation of diseased animals into healthy herds.

Preventive and curative serum for sheep pox, E. THIERRY (*Jour. Agr. Prat., n. ser., 7 (1904), No. 3, pp. 83–86*).—The results which have been obtained by various experimenters in preventing and curing this disease by serum therapy are briefly outlined. The author believes that the chief cause of accident in applying this treatment is carelessness in the matter of details.

The virulence of the fleece of sheep recovered from sheep pox and not washed, L. DUCLERT and A. CONTE (*Rev. Vét. Toulouse, 28 (1903), No. 6, pp. 335–339*).—On account of the marked infectiousness of this disease the author attempted to determine the period during which the virus may retain its virulence in the fleece of recovered sheep. It was found that within 58 days after inoculation or 46 days after a generalization of the disease the pustules had dried up entirely and were covered with brown scales. Experiments showed that native sheep which had been vaccinated were not likely to spread contagion after a lapse of 2 months from the time of inoculation.

A clinical study of variola in goats, A. CONTE (*Rev. Gén. Méd. Vét., 2 (1903), No. 24, pp. 635–639*).—Until within recent years this disease has been considered as identical with sheep pox. It has been shown, however, to be a specific disease. Goats are not susceptible to sheep pox. Variola in goats terminates with complete recovery in almost all cases. The pustules developed during the progress of this disease furnish a means of distinguishing between it and sheep pox. The disease does not spread as rapidly as sheep pox or foot-and-mouth disease, with which it might be confused. In preventing the disease it is recommended that attention be given to disinfection of premises and isolation of diseased goats.

Swine fever, S. STOCKMAN (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 213–219, pl. 1*).—The symptoms, etiology, diagnosis, and treatment of this disease are briefly discussed in connection with statistics relating to the prevalence of hog cholera in America.

Swine fever, W. C. QUINNELL (*Jour. Agr. and Ind. South Australia, 7 (1903), No. 5, pp. 308–311, figs. 4*).—Brief notes on the symptoms, post-mortem lesions, and means of eradication of this disease.

Combating swine erysipelas, J. J. WESTER (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 2, pp. 49–63*).—Vaccination is said to be the most rapid and effective method for preventing the general and destructive spread of this disease. The author states that the danger from vaccination is so slight as to be largely characterized as imaginary. Vaccination is therefore recommended as a general method for preventing swine erysipelas.

Swine erysipelas and its treatment, BERTSCHY (*Schweiz. Arch. Tierh., 45 (1903), No. 3, pp. 115–119*).—Notes are given on the distribution and occurrence of this disease. In the Canton of Zurich in the year 1902, 2,242 hogs were vaccinated with the following results: In 2,141 animals no symptoms of the disease appeared; among the 101, however, which were already affected with swine erysipelas, 87 recovered while 14 had to be killed. The expense of the treatment was about 25 cts. per animal.

The work of sanitary police with regard to swine erysipelas, G. FERRANT (*Rev. Vét. Toulouse, 28 (1903), No. 2, pp. 84–87*).—Attention is called to the danger of starting an infection from the many hogs which are transported from place to place freely, although suffering from a latent infection of this disease. After a period of 10 days following treatment by an immunizing serum it is believed that animals are not likely to transmit infection.

The presence of the bacillus of swine erysipelas on the mucus membrane of healthy pigs, C. O. JENSEN (*Rev. Vét. Toulouse, 28 (1903), No. 9, pp. 533–538*).—The bacillus of this disease varies greatly and different individuals and races of pigs exhibit considerable difference in their susceptibility to the disease. The author calls attention to the almost normal and very frequent occurrence of this bacillus on the mucus membranes of healthy pigs.

Vaccination for hog cholera according to the method of Poels, H. ANKER (*Tijdschr. Veeartsenijk. Maandblad, 30 (1902), No. 2, pp. 63–80*).—The details of this method are briefly described and notes are presented on a number of experiments which were made in its application. The author concludes from his experiments

that a certain percentage of pigs vaccinated by the method of Poels may die of inoculation hog cholera, or may suffer from a chronic form of the disease as a result of vaccination. Great care is therefore recommended in the use of this method.

Observations on recovery from glanders, Mouilleron (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 24, pp. 530–535*).—Clinical notes are presented on 4 cases of glanders in horses which ultimately recovered entirely. The horses were given mallein injections at intervals during periods of 3 to 4 years. Finally each horse was killed and subjected to a careful post-mortem examination and microscropic study. Material was also taken for use in the inoculation of male guinea pigs. Negative results were obtained from all these tests for the presence of the glanders bacillus.

Immunity toward contagious coryza, J. Schnürer (*Ztschr. Thiermed., 7 (1903), No. 3–4, pp. 286–307*).—The literature of this subject is critically discussed by the author. A number of cultures of the streptococci of contagious coryza were examined by the author, in all 13 cases in horses. This organism was found in an abscess of infected laryngeal lymph glands. Notes are given on the biology of this organism.

All cultures obtained by the author were found to be virulent for white mice. These animals died within 2 to 4 days after inoculation. Streptococci, however, were only slightly virulent for rabbits and guinea pigs. Experiments were made on white mice, rabbits, and 1 ass, for the purpose of testing the possibility of immunizing animals against this disease. During these experiments it was found that no substance was present in the serum of horses affected with spontaneous cases of contagious coryza or artificially immunized against this disease, which had any active influence in checking the progress of the disease in experimental animals.

Mal de caderas affecting horses, G. d'Utra (*Bol. Agr. São Paulo, 4. ser., 1903, No. 11, pp. 501–520*).—The literature relating to this subject is critically discussed. Notes are given on the ordinary clinical forms of mal de caderas, including the chronic and paralytic forms. The treatment of the disease is also briefly discussed and reference is made to the agency of insects in carrying the blood parasite.

Mal de caderas in South American horses, J. Lignières (*Rec. Méd. Vét., 8. ser., 10 (1903), Nos. 2, pp. 51–69; 4, pp. 109–134; 6, pp. 164–190, pls. 2*).—This disease is due to infection by *Trypanosoma elmassiani*. Notes are given on the morphology of the organism and its various developmental forms. Special attention is devoted to a discussion of agglutination of the blood parasite and its behavior toward antiseptics.

The vitality of the organism of mal de caderas differs greatly according to the medium in which it is grown. Agglutination takes place either in more or less irregular masses, or rarely in the form of a row of beads. In general agglutination occurs rapidly, but the phenomenon may disappear after a short period. The author made a number of experiments in inoculating animals with this organism and concludes that animals are susceptible to this disease in the following order: White mice, white rats, gray mice, gray rats, dogs, coati, horses, rabbits, cats, guinea pigs, sheep, cattle, pigs, etc. Notes are given on the development of the disease in these various animals and the differences between *T. elmassiani* and other species of this genus are described.

The relationship between surra and nagana according to an experiment of Nocard, Valée and Carré (*Compt. Rend. Acad. Sci. Paris, 137 (1903), No. 16, pp. 624, 625*).—The authors present the details of an experiment carried out by Nocard during which it was shown that a cow immunized against nagana was as susceptible to surra as untreated animals. It was found that 3 months after the appearance of surra in this animal the blood contained the organism of surra and was very virulent for mice, as shown by inoculation experiments.

Erysipelas in horses, Osterwald (*Ztschr. Veterinärk., 15 (1903), No. 7, pp. 319–322*).—An outbreak of this disease occurred among a troop of cavalry horses and spread with considerable rapidity. Notes are given on a number of cases observed

in different years from 1888 to 1902. The symptoms are fever, reddening of the mucous membranes, discharges from the eyes, swelling of the eyelids, swelling of the legs and in the skin and other parts of the body. The disease attacks young horses more frequently. Success was had in treating the disease by proper attention to diet and by rubbing affected parts with spirits of camphor and antiseptic solutions.

The treatment of morbus maculosus with Ichthargan, LANGE (*Ztschr. Veterinärk.*, *15* (*1903*), *No. 3*, *pp. 117–119*).—For horses of medium size Ichthargan was found to produce good results when injected in doses of 3 gm. per day. Experiments showed, however, that this remedy does not exercise any effect upon the organism of morbus maculosus except in the circulating blood. It is recommended, therefore, that the treatment be repeated daily.

A skin eruption on the head of horses, SCHEFERLING (*Ztschr. Veterinärk.*, *15* (*1903*), *No. 7*, *pp. 322–326*, *fig. 1*).—This disease occurred in a number of horses and appeared to be confined entirely to the head. It began as a rule at the corners of the mouth and progressed backwards to the ears. Pustules were formed and the hair of affected parts was shed. The lymphatic glands of affected regions were also swollen and became distinctly visible. These symptoms could be controlled, however, by external treatment with potassium iodid. In some of the pustules *Staphylococcus pyogenes aureus* were found. Inoculation experiments with this organism, however, failed to reproduce the disease in any case. The true cause of the disease was believed to be a mite, *Cheyletus eruditus*, which was found in the skin and in the swollen lymphatic glands.

Lymphangitis, COLLARD (*Rec. Méd. Vét.*, *8. ser.*, *10* (*1903*), *No. 22*, *pp. 502–504*).—This disease, which is known in many parts of France and elsewhere under the name edema, appears suddenly and leads to the development of high fever in infected horses. The etiology of the disease appears to be obscure and so far as experiments have been made treatment is unsatisfactory.

Apoplectic hemorrhagic septicemia of new-born colts, C. DARMAGNAC (*Rec. Méd. Vét.*, *8. ser.*, *10* (*1903*), *No. 11*, *pp. 373–377*).—Detailed clinical notes are given on a number of cases of this disease. From a study of these cases the author comes to the conclusion that infection takes place through the umbilical vessels, and that the sudden development of the disease is due to the rapid spread of the toxin by means of the circulation. Good results have been obtained in controlling the disease from the application of thorough antisepsis to the umbilical cord, as recommended by Nocard in combating white scours.

The occurence of ticks on horses, D. JUNACK (*Ztschr. Veterinärk.*, *15* (*1903*), *No. 6*, *pp. 258, 259*).—Brief notes are given on the excessive infestation of horses by *Ixodes ricinus*. These ticks fasten themselves to the skin of horses in almost any location, and their occurrence in unusually large numbers caused the falling of the hair on infested areas and also other inflammatory processes in the skin.

Colics of the horse and their treatment, V. DROUIN (*Rec. Gén. Méd. Vét.*, *2* (*1903*), *No. 23*, *pp. 569–582*).—The various forms of colic which have been observed in the horse are classified according to their etiology and symptoms. Notes are given on the use of asafetida, opiates, Indian hemp, carbonate of ammonia, nux vomica, eserin, barium chlorid, and other drugs in the treatment of colics.

A pathology for forage poisoning, or the so-called epizootic cerebro-spinal meningitis of horses, D. J. MCCARTHY and M. P. RAVENEL (*Jour. Med. Research*, *10* (*1903*), *No. 2*, *pp. 243–249*, *pl. 1*).—In certain cases of so-called epizootic cerebro-spinal meningitis the cause was clearly traced to the feed which the horses had eaten. While feeding experiments conducted in connection with a spontaneous outbreak of this trouble showed that the disease was due to spoiled feeding materials, it was not possible to isolate any pathogenic organism which caused the trouble.

A careful post-mortem examination of animals affected with this disease revealed the presence of lesions in the anterior portion of the alimentary tract and also in

various parts of the nervous system, including the intervertebral and Gasserian ganglia, cerebral and cerebellar cortex, choroid plexuses, cerebral ventricles, and peripheral nerves of the larynx. Lesions in the intervertebral ganglia closely resemble those observed in cases of rabies as described by Van Gehuchten and Nélis. The disease may be distinguished from rabies, however, by the absence of the pericellular lesions in the medulla oblongata.

The authors conclude from their study of this disease that it is not a true meningitis, and propose the name forage poisoning as much more suitable. It appears that all epizootic outbreaks of the disease are due to some poisonous substance contained in the forage.

Rabies in the horse, FRANCKE (*Fortschr. Vet. Hyg., 1 (1904), No. 10, pp. 280–283*).—This subject is discussed in a general manner and detailed notes are given on a case of equine rabies which came under the author's attention. The symptoms and pathological anatomy are carefully described on account of the comparative rarity of this disease in horses.

Rabies, D. SIME (*Cambridge, Eng.: University Press, 1903, pp. XII+290*).—The purpose of the author in this volume is to present a general account of rabies in all its aspects. Special chapters are devoted to a discussion of the salivary glands, the medulla oblongata, symptoms of rabies, the occurrence of the disease in the sympathetic nervous system and other parts of the nervous system, incubation period, rabies virus, and the animals chiefly concerned in the spread of the disease.

Animals which are susceptible to rabies are classified into 2 groups, viz, intensifiers and attenuators. Herbivorous animals intensify the virulence of rabies virus, while carnivorous animals, particularly man, monkeys, and dogs, attenuate the virus. While the usual outbreaks of rabies are attributable to the existence of the disease in dogs, the author argues that the chief source of rabies is rabbits. Statistics indicate that the disease prevails most extensively in regions where rabbits are most numerous, and the countries where rabbits are unknown are shown to be also free from rabies. Australia, Tasmania, and New Zealand are cited in proof of this proposition, since rabbits were introduced there within comparatively recent times and since dogs have always been numerous in those islands.

The type of rabies in rabbits is not usually violent and the author thus accounts for the absence of epizootic outbreaks of rabies among these animals. The prevalence of rabies in dogs is attributed to the fact that dogs hunt and eat rabbits, and may thereby become infected by injuries to the mucous membranes of the mouth by broken bones of the rabbits.

The etiology of rabies, A. NEGRI (*Ztschr. Hyg. u. Infectionskrank., 44 (1903), No. 5, pp. 519–540*).—The author calls attention to his discovery of an organism belonging to the Protozoa and found in various parts of the nervous system of rabid animals. It is claimed that this organism occurs exclusively in the nerve cells of rabid animals and is the specific cause of rabies. The organism is described and notes are given on the lesions in the nervous system apparently due to the attacks of the organism.

During the author's investigations 75 animals suspected of being rabid were examined, and of these 52 proved to be suffering from rabies. In 50 of these 52 cases the protozoan organism was found by an examination of the hippocampus alone. The author concludes, therefore, that the identification of this organism may serve as a convenient and certain means of diagnosing rabies.

A study of the etiology of rabies, A. NEGRI (*Ztschr. Hyg. u. Infectionskrank., 43 (1903), No. 3, pp. 507–528, pls. 2*).—An organism belonging to the Protozoa was found by the author in various parts of the central nervous system, but especially in the hippocampus. This organism may be demonstrated most easily in dogs which have been experimentally infected with street virus by the subdural method. In the author's experience the best stain for differentiating this organism is methyl blue and eosin, according to the method of Mann.

The passage of rabies virus through filters, Remlinger (*Ann. Inst. Pasteur, 17 (1903), No. 12, pp. 834–849*).—A number of experiments were carried out in inoculating rabbits with rabies virus. While the subdural inoculation produces rabies, the subcutaneous inoculation immunizes the rabbit against the disease. Experiments were made in filtering virus, but on account of the fact that virus which had been passed through a Berkefeld filter was found to be still pathogenic, the conclusion is drawn that the rabies organism must be ultramicroscopic in size. From the fact, however, that the use of a centrifuge separates the virus into a peripheral inactive and central active portion, it is concluded that the cause of rabies is a definite organism and not a mere toxin.

Rabies virus obtained from spontaneous cases of the disease and fixed virus, Schüder (*Ztschr. Hyg. u. Infectionskrank., 42 (1903), No. 3, pp. 362–388*).—Experiments were carried on for the purpose of determining the cause of the difference between these 2 forms of the virus. During the author's experiments it was found that the course of spontaneous cases of rabies was from 2 to 5 days and seldom exceeded 6 days. The incubation period of spontaneous cases, however, varied greatly.

It is believed that the striking variation in the period of incubation in cases of spontaneous rabies is due largely to the different specific properties of the samples of virus obtained from spontaneous cases of the disease. Street virus can not be assumed to have a constant virulence, as is the case with the fixed or laboratory virus. Further experiments showed that the incubation period was almost the same in all cases where the experimental animals were inoculated with street virus obtained from the same source.

The author believes from his studies that the lesions in the central nervous system in cases of rabies are due to the toxins produced by the pathogenic organism and not to the organism itself.

Differential diagnosis of rabies by subdural inoculation of rabbits, A. N. Aleksyeev (*Uchen. Zapiski Kazan Vet. Inst., 20 (1903), No. 5–6, pp. 485–490*).—This method was tested in diagnosing rabies in suspected dogs brought to the laboratory.

The first experiments consisted in the inoculation of 1 rabbit with a portion of the medula oblongata and another rabbit with an emulsion of similar material. The first rabbit died 169 days after inoculation, while the second remained alive. Further experiments were made in inoculation of rabbits for the purpose of determining the incubation period of rabies produced by the use of street virus. The author concludes from his experiments that the variation in the incubation period in rabbits inoculated by the subdural method is due largely to the different susceptibility of different rabbits to street virus.

The histological diagnosis of rabies, Vallée (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 4, pp. 93–97*).—According to the author's observations the special lesions in the cerebro-spinal and sympathetic ganglia as described by Van Gehuchten and Nélis are observed in the majority of cases. They were present in all of 42 dogs which died of rabies and in 25 out of 40 rabid dogs which were killed before the termination of the disease. The author concludes, therefore, that these histological lesions may be relied upon in the diagnosis of rabies in dead animals.

Fowl cholera (*Jour. Bd. Agr. and Fisheries [London], 10 (1903), No. 3, pp. 351–354*).—A short account of the symptoms and pathological anatomy of this disease. Recommendations are also made concerning disinfectant methods which are best suited for use in the prevention of this disease and in cleaning poultry houses after outbreaks of the disease have occurred.

The hemolysin of fowl cholera, D. Calamida (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 5, pp. 618–621*).—The material used by the author was obtained from an infected fowl during an outbreak of the disease. For the purpose of obtaining hemolysin, cultures were made in bouillon prepared from peptonized meat. The

results of the author's experiments indicate that bouillon cultures of the bacillus of fowl cholera may produce a hemolysin which occurs in maximum quantity after the material has been maintained for 12 days at a temperature of 37° C. The hemolysin, while not especially resistant toward higher temperatures, appeared to withstand heat until subjected to a temperature of 70° C. for ½ hour. Hemolysin thus obtained has no toxic effect upon animals and its formation does not precede the agglutinations of the red blood corpuscles. Its hemolytic effect was greatest upon the red blood corpuscles of rabbits and less pronounced upon those of guinea pigs and fowls.

A new disease of poultry, E. THIERRY (*Jour. Agr. Prat., n. ser., 7 (1904), No. 5, pp. 150, 151*).—The author gives a brief description of fowl plague, with particular reference to the symptoms which differentiate this disease from fowl cholera. Notes are also presented on the distribution of the disease in various parts of Europe.

Spirillosis in geese, DUCLOUX (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 16, pp. 360, 361*).—Notes are given on a disease of geese due to infection with *Spirochæte anserina*. The disease prevails most extensively in young geese and its course and development are very rapid. The symptoms are progressive weakness, diarrhea, and elevation of temperature. Death almost always occurs as the result of infection. The disease may also be transmitted to ducks.

The nonidentity of human and avian diphtheria, C. GUÉRIN (*Rec. Méd. Vét., 8. ser., 10 (1903), No. 1, pp. 20–28*).—The literature of this subject is briefly reviewed, with special reference to a determination of the nature of the organism which causes avian diphtheria. This organism is believed to belong to the genus Pasteurella, but to be distinct from the cause of human diphtheria.

Epidermophyton gallinæ, L. PALMANS (*Bul. Agr. [Brussels], 19 (1903), No. 6, pp. 1206–1208*).—This parasitic fungus, which has also been referred to the genus Lophophyton, is the cause of a skin disease of the head of fowls. It apparently does not attack other animals. The author found that it was a comparatively simple matter to cultivate this organism on various nutrient media, and notes are given on its behavior in artificial cultures. The disease may be successfully combated by treating the affected parts of fowls with solutions of various antiseptics.

AGRICULTURAL ENGINEERING.

The official proceedings of the Eleventh National Irrigation Congress, held at Ogden, Utah, September 15–18, 1903, edited by G. MCCLURG (*Proc. Nat. Irrig. Cong., 1903, pp. 472, figs. 49*).—This includes the organization, official call, constitution, a general review of the proceedings, and the minutes of the various sessions, including besides addresses of welcome, message from the President, reports of committees, resolutions, etc., the following addresses and papers: President's Address, by W. A. Clark; The Twin Ideas of Irrigation and the Conservation of Water for the Prevention of Floods, by J. R. Burton; Relation of Irrigation to Internal Trade and Commerce, by T. G. Haley; Colonization and Irrigation, by C. E. Wantland, J. M. Carson, J. H. Smith, C. C. Pardee, and F. Booth-Tucker; The Repeal of Some of Our Land Laws, by P. Gibson; Value and Importance of the Desert Land Law, by F. Mondell; The Utilization of the Public Grazing Lands of the United States, by W. M. Wooldridge; State Cooperation in National Irrigation, by F. Newlands; Irrigation Investigations made by the United States Department of Agriculture, by James Wilson; Irrigation as Shown at the World's Fair, by F. W. Taylor; The Victories of Peace, by G. H. Maxwell; The Influence of Irrigation on the American Ideal, by W. E. Smythe; Relation of National Irrigation to Local Problems, by F. E. Brooks; Alkali Reclamation, by T. H. Means; Forests and Water Supply, by F. H. Newell; Forestry, by G. Pinchot; Forest Reserves in Utah, by A. F. Potter; Irrigation in Utah, by A. F. Doremus; Irrigation Investigations of the United States Department of Agriculture, by W. H. Beal; The Irrigation Investigation of the Utah Experiment Station, by J. A. Widtsoe; The Value of the Study of

the Use of Water, by S. Fortier; The Planting of Trees on Prairie Lands where Irrigation is Impossible, by D. E. Willard; Pumping Water for Irrigation in Western Kansas, by J. G. Haney; Weather Bureau Cooperation in Reclamation Work, by F. H. Brandenburg; Irrigation Investigations in Nebraska, by O. V. P. Stout; Drainage Investigations in the Yakima Valley, Washington, by C. G. Elliott; Sugar Beet Culture in Utah, by H. H. Rolapp; Irrigation and Beet Sugar, by T. G. Palmer; The Sugar Beet, the Ideal Crop for Irrigated Areas, by H. W. Wiley; Horticulture under Irrigation, by J. A. Wright; Irrigation and Live Stock, by T. Shaw; Horticulture under Irrigation, by J. H. Richards; National Irrigation and Oriental Trade, by W. M. Bunker; Relation of the Eastern Farmer to National Irrigation, by C. B. Boothe; Fungus Diseases in Fruit Trees, by H. E. Dosch; Irrigation-Grown Barley, by H. Altenbrand; Forestry at Universal Expositions, by T. H. Bean; New Irrigation Construction on Snake River, Idaho, by J. D. Schuyler; Reclamation Work in Idaho, by D. W. Ross; The Salt River Reservoir, by A. P. Davis; Milk River Project, Montana, by C. C. Babb; Irrigation in Oregon, by J. T. Whistler; The Gunnison Tunnel, by A. L. Fellows; Development on the North Platte River in Wyoming, by J. E. Field; Correct Design and Stability of High Masonry Dams, by G. Y. Wisner; Electrical Transmission of Power for Pumping, by H. A. Storrs; Relation of Federal and State Laws to Irrigation, by M. Bien; State Progress in Irrigation, Wyoming, by C. T. Johnston; Wyoming's Use of Its Lands, by J. A. Breckons; Irrigation Progress in Nebraska, by A. Dobson; The Irrigation Laws of Nevada, by A. E. Chandler; Our Inheritance, by W. K. McAllister; Why and How State and Federal Government Should Cooperate for Irrigation, by F. H. Ray; This Year's High Tide of Immigration, by S. E. Moffett; Drainage and Irrigation, by H. H. Harrison; Utah Lake Reclamation Project, by G. L. Swendsen, and an address by F. T. DuBois.

Irrigation in humid districts, E. B. VOORHEES (*Cornell Countryman, 1 (1904), No. 2, pp. 39, 40*).—A brief discussion of the need and difficulty of securing proper irrigation in humid regions.

Report of the Indian Irrigation Commission, 1901–1903, C. SCOTT-MONCRIEFF ET AL. (*London: Eyre & Spottiswoode, 1903, pts. 1, pp. XIII+130, pl. 1; 2, pp. XXII+260, maps 2; 3, maps 6; 4, pp. 397*).—This report deals with the following subjects: Preliminary survey, limitations of irrigation, state irrigation works, scope for further extensions of state irrigation works, private irrigation works, loans for improvements, artesian wells, classification and financing of irrigation works, methods of charging for water, establishments, hydraulic and agricultural experiments, and famine relief works and programmes; the status of irrigation in Punjab, Bombay, Madras, Central Provinces, Bengal, United Provinces, Upper Burma and Baluchistan, and Native States; and selected evidence, statistics, maps, etc. (See also E. S. R., 15, p. 308.)

Studies on the irrigation of the Jauja, D. VALDIZÁN (*Estudios sobre la Irrigación de Jauja. Lima, Peru: Libreria de San Pedro, 1903, pp. 49, figs. 8, map 1*).—Plans and specifications for works for supplying the city and valley of Jauja with water for domestic and irrigation purposes.

Acquirement of water rights in the Arkansas Valley in Colorado, J. S. GREENE (*U. S. Dept. Agr., Office of Experiment Stations Bul. 140, pp. 83, pl. 1, fig. 1*).—This bulletin gives the results of investigations on the different kinds of water rights recognized in this region and the manner in which they affect the well-being of irrigators. It also describes physical conditions which affect the value of water rights. "The subject is presented in such a way as to be of aid to intending settlers in showing them some features of irrigation which should be looked into, and where needed information can be found. While these rights are considered primarily from the standpoint of the farmer, the interests of investors in irrigation works and of the public in the best use of the water supply are also kept in mind."

Preliminary report on the geology and water resources of Nebraska west

of the one hundred and third meridian, N. H. DARTON (*U. S. Geol. Survey Prof. Paper 17, pp. 69, pls. 43, figs. 23*).

Some observations on sewage farms in England (*Engineer. News, 51 (1904), No. 16, pp. 385–387*).

The trials of wind-pumping engines at Park Royal, 1903, F. S. COURTNEY and W. N. SHAW (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 174–220, figs. 17*).—Includes notes by the society's consulting engineer and report of the judge.

Miscellaneous implements exhibited at Park Royal, 1903, J. B. DUGDALE (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 221–241, figs. 17*).

MISCELLANEOUS.

Proceedings of the eighth annual meeting of the American Association of Farmers' Institute Workers, edited by W. H. BEAL and G. C. CREELMAN (*U. S. Dept. Agr., Office of Experiment Stations Bul. 138, pp. 119*).—This is a detailed account of the proceedings of the meeting held at Toronto, Ontario, June 23–26, 1903. A summarized account of this meeting has been given (E. S. R., 15, p. 101).

Special and short courses in agricultural colleges, D. J. CROSBY (*U. S. Dept. Agr., Office of Experiment Stations Bul. 139, pp. 59*).—This is a summary of information on the special and short courses in agriculture and related subjects offered at the land-grant colleges. Of the 63 agricultural colleges and schools receiving funds from the National Government 44 have organized such courses. These courses are designed to meet the requirements of those preparing to enter a regular agricultural course, those desiring instruction in agricultural subjects but not fully qualified for college work, those desiring instruction in some particular phase of agriculture, and teachers desiring to prepare themselves to give instruction in nature study and elementary agriculture. Brief statements are made concerning the date of opening, length, nature, admission requirements, and cost of attending these courses.

Finances, meteorology, index (*Maine Sta. Bul. 99, pp. 203–219 + VIII*).—This includes reprints of 4 newspaper bulletins on fertilizers for mangel-wurzels, forage crops to supplement summer pasture and winter hay, insecticides, and cotton-seed meal; meteorological observations noted elsewhere; a financial statement for the fiscal year ended June 30, 1903; the organization list of the station; and announcements relative to station work.

Annual Report of Nevada Station, 1903 (*Nevada Sta. Rpt. 1903, pp. 27*).—This consists of a report of the director on the work of the station during the year; a financial statement for the fiscal year ended June 30, 1903; and departmental reports.

Director's Report for 1903, W. H. JORDAN (*New York State Sta. Bul. 244, pp. 375–398*).—This is a rather extended review of the work of the New York State Station during the year. A financial statement is included, and a summary is given of the results of the inspection of fertilizers and feeding stuffs. Outlines are given of the work in the departments of animal husbandry, bacteriology, botany, chemistry, entomology, and horticulture; some of the results obtained being briefly summarized.

Twenty-second Annual Report of Ohio Station, 1903 (*Ohio Sta. Bul. 143, pp. XIX*).—This includes an announcement concerning the work of the station, the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1903, and a report of the director summarizing the work of the station during the year.

Press bulletins (*Ohio Sta. Bul. 143, pp. 145–153*).—Reprints of press bulletins on the following subjects: Caustic soda for Bordeaux mixture, the chinch-bug campaign, grape rot prevention, spraying for bitter rot of apples, loss of leaves by cherry-leaf spot and shot-hole fungus, tomato-leaf spot and muskmelon blight, a ten-year comparison of varieties of wheat, how to circumvent the Hessian fly, and fruit lists.

Report of the sugar experiment station in West Java, H. C. P. GEERLIGS (*Verslag Proefstat. Suikerriet, West Java, 1903, pp. 32, pls. 6*).—A condensed account

is given of the work of the station for the year 1903, with brief notes on the publications of the various investigators connected with the station.

Report on the agricultural fund of Cyprus, W. F. H. SMITH (*London: Darling & Son, 1903, pp. 29*).—In this pamphlet a statement is made regarding the industrial conditions of Cyprus with especial reference to agricultural improvements. Notes are also given on the statistics of agricultural production, including an account of the growing of various crops such as figs, cotton, grapes, etc., and notes on rainfall and soil conditions.

Progress in the manufacture of beet sugar during the last ten years, H. CLAASSEN (*Ztschr. Angew. Chem., 17 (1904), Nos. 13, pp. 385–389; 14, pp. 417–420*).

Note on the cotton-seed oil industry and the establishment of cotton-seed oil mill in India, J. MOLLISON (*Agr. Ledger, 1903, No. 9 (Veg. Prod. Ser., No. 75), pp. 215–232*).

[Agricultural conditions in Cape of Good Hope], E. A. NOBBS (*Report of Dr. Eric A. Nobbs, for the year 1903. Dept. Agr., Cape Good Hope, 1904, pp. 75*).—A general account, including statements regarding irrigation works and development in the Colony.

The organization and work of agricultural departments in Western Europe and the United States, A. SCHULTZ (*Byudzhetui organizatzyia i dyeyatelnost selskokhozyaistvennuikh vyedomstv zapadnoi Evropye i Syevero-Amerikanskikh Soedinennuikh Shtatakh, St. Petersburg, Dept. Agr., 1903, pp. 465.*)—The author presents a detailed account of the organization, work, equipment, and financial support of the Department of Agriculture in Sweden, Norway, Denmark, Great Britain, Belgium, France, Germany, Austria-Hungary, Italy, and the United States.

The settlement of Samoa, F. WOHLTMANN (*Pflanzung und Siedlung auf Samoa. Berlin: Kolonial-Wirtschaftliche Komitee, 1904, pp. V+164, pls. 20, figs. 9, maps. 4*).—This is a report on agricultural conditions in the Island.

Agriculture in primary schools (*New Zealand Dept. Agr. Rpt. 1903, pp. 419–422, pls. 3, dgm. 1*).—An account is given of the teaching of elementary agriculture in Mauriceville West School, with syllabus of the theoretical and practical work offered during the first and second years. A plan of the garden is given with a number of illustrations showing different phases of the work.

Progress in women's education in the British Empire (*London and New York: Longmans, Green & Co., 1898, pp. XXIV+370, charts 5, dgms. 2*).—This book is the report of the proceedings of the Education Section of the Victorian Era Exhibition in 1897, and is edited by the Countess of Warwick. It contains three series of papers and addresses on the following subjects: (1) Education of children; (2) some professions open to women; and (3) education in India and the colonies: University extension. Under "professions open to women" appear a number of papers on agricultural education for women in Great Britain and the colonies.

How to teach nature study, A. M. KELLOGG (*New York and Chicago: E. L. Kellogg & Co., pp. 55+VII, charts 6*).—This is the second number of a series of "How to Teach" Manuals. In it the author defines the term "nature study," gives its origin, object, etc., as well as detailed general and special methods for teaching this subject. The Massachusetts course of nature study covering nine years is fully described.

Science teaching and nature study (*Southampton: H. M. Gilbert & Son, pp. 48*).—This is the report of the proceedings of the nature study conference and exhibition held at the Hartley College, Southampton, in June, 1902. Educational institutions of all classes joined in sending contributions which made the exhibition a pronounced success.

At the conference the following papers were read: The Aim and Object of Nature Study, by R. Hedger Wallace; Beginning the Study of Science, by A. T. Simmons; The Teaching of Natural History on Humane Lines, by Mrs. Suckling; Example of

a Definite Plan for Nature Study in a Primary School, by T. G. Rooper, and Science Teaching and Nature Knowledge in Connection with the Perthshire Natural History Museum, by Henry Coates. A nature-study bibliography is appended.

The educational value of nature study, J. C. MEDD (*Cirencester: George H. Harmer, pp. 17*).—An address delivered by the author at the conference of the Private Schools' Association, at Harrogate, in June, 1903.

Ways of the six-footed, ANNA B. COMSTOCK (*Boston: Ginn & Co., 1903, pp. XII + 152, figs. 47*).—This is a collection of 10 nature-study stories dealing with crickets, bees, wasps, ants, leaf cutters, leaf rollers, butterflies, and 17-year locusts in a popular manner.

The nature student's note book, C. STEWARD and ALICE E. MITCHELL (*Westminster: Archibald Constable & Co., Ltd., pp. 152*).—Part 1 of this book consists of nature notes. Blank pages are inserted on which students may record regularly their own discoveries and observations. A list of books of reference for school gardening is also given, as well as a list of injurious insects and a summary of the wild birds protection acts, 1880–1896. Part 2 consists of tables for classification of plants, animals, and insects in full detail, with methods for using the tables.

NOTES.

Florida Station.—F. C. Reimer, assistant horticulturist and botanist at the station, has been appointed acting head of that department pending the appointment of a horticulturist and botanist. The Department is continuing its work in tomato breeding, started a year or two ago, with the object of securing varieties immune to tomato blight. Some promising results have already been secured.

Georgia College.—The chemical building (Terrill Hall), which is being erected at a cost of $30,000, on the foundation of the old one (Science Hall), which was destroyed by fire in November, 1903, will be one of the best constructed and equipped chemical laboratories in the South. Special provisions are being made for laboratories designed to meet the requirements of organic chemistry, physical chemistry, and electro-chemistry; and in addition to these special laboratories there will be a laboratory for beginners accommodating 120, a junior laboratory accommodating 36, a senior laboratory accommodating 18, a large pharmaceutical laboratory, two private laboratories, assay rooms, a large library room, two stock rooms, three museum rooms, four large lecture rooms, a balance room, a dark room, and a large fireproof vault. The building will be 75 by 133 ft., and three stories in height. The walls will be of brick, with a facing of red pressed brick, and all the floors will be supported by heavy steel girders. It is expected to be ready for occupancy by January 1, 1905.

Kansas College and Station.—The Kansas State Agricultural College has recently completed a new building to be used exclusively for dairy manufactures, the dairy machinery having been hitherto in Agricultural Hall. Prof. Oscar Erf, of the department of animal and dairy husbandry, has been given leave of absence in order to take charge of the scientific work in connection with the dairy exhibits and tests at the Louisiana Purchase Exposition. Professor Erf planned the creamery which is operated in connection with the exposition. Leslie F. Paull has resigned his position as assistant botanist in the college and station, to take a position in the Bureau of Plant Industry of this Department.

Missouri University and Station.—H. J. Waters has been given a further leave of absence for one year, for study and travel in Europe. Dr. J. W. Connaway has also been granted leave of absence for study abroad. In the absence of C. H. Eckles, who has gone abroad for a year or more, R. M. Washburn will be in charge of the dairy work. Dr. J. B. Tiffany, of Cornell University, has been appointed instructor in veterinary science, vice R. J. Foster, resigned. George M. Tucker, instructor of agronomy at the university and agronomist in the station, has resigned his position, and Merritt F. Miller, assistant professor of agronomy at the Ohio State University, has been elected to succeed him.

New Hampshire College and Station.—The completion of the new range of greenhouses was celebrated by a reception given by Prof. F. W. Rane May 20. The greenhouses were constructed with an appropriation of $7,000 made by the last legislature, and were first occupied by the department at the close of the winter term. They are steel structures, designed for both instruction and experimental work. The total

area under glass is 6,635 sq. ft. There are 7 distinct houses, besides a runway 10 by 44 ft., which is used for cutting benches on either side of the walk. Two of the houses have ground beds, similar to those found in the vegetable forcing structures about Boston, and the remainder have raised benches.

One house, 20 by 47½ ft., is used entirely as a greenhouse laboratory for instruction. This has a 3-ft. side bench built against the wall on either side, with a double row of students' workbenches 3 ft. 9 in. wide in the center, extending the entire length of the house and separated by a narrow passageway for the instructor. The students' benches are separated from the wall benches by a walk 2½ ft. wide. Each student has a space 5 ft. in length, from the side of which next to the walk a space 1 ft. by 18 in. is removed to give standing room for the student, thus keeping the walk behind him open. The wall bench behind each student is used for his potted plants, stock for cuttings, etc.

The greenhouses are connected with a potting house 20 by 30 ft., which has a basement used as a boiler room, and a finished room in the second story for the gardener. The main floor is provided with closets for tools, lockers for the students' working suits, a bench for making design work, etc. The range has a double system of heating, and each house is piped independently so that almost any range of temperature can be had which is desired for experimentation. Heat is supplied from the college heating plant, and there is a sectional steam boiler located in the basement of the potting house. The latter can be used in the spring and fall and at such other times as is desired. Each house has its own ventilating system and is lighted by electricity on separate switches.

Ohio University and Station.—The appropriation of $75,000 made by the legislature for the College of Agriculture of the University was vetoed by the governor. The following appropriations were made for the station for the current year: For expenses of the board of control, $800; publication of bulletins, $3,800; special work in entomology, botany, chemistry, and horticulture, $8,000; substations for field experiment, $7,000; general repairs, labor, and supplies, $7,500; special work in animal industry, $2,500; library equipment and care, $250; general construction, $2,000; purchase of test farm in southeastern Ohio, in part, $5,000; total, $36,850.

The test farm, the purchase of which is authorized by the last item of the budget, has been located in Meigs County, about 18 miles south of Athens. It contains 300 acres, and the purpose is to devote it to the study of such problems as especially concern the agriculture of the hilly counties of southern Ohio. It is expected that animal husbandry, orchard culture, and forestry will receive special attention. J. M. Van Hook, assistant plant pathologist of the Cornell Station, has accepted a similar position at this station. F. H. Ballou, of Newark, Ohio, has been appointed assistant horticulturist to the station, in charge of the orchards. Frank A. Welton, a this year's graduate of Buchtel College, Akron, Ohio, has been appointed assistant chemist to the station. J. L. Taggart, horticultural foreman, has resigned to take charge of a commercial orchard near New York.

A department of cooperative experiments has been organized in the station, to continue the cooperative work heretofore conducted by the Agricultural Student Union of Ohio, and L. H. Goddard has been appointed experimentalist. It is expected that the Student Union will maintain an organization holding an advisory relation to this department of the station and to the extension work of the College of Agriculture of the State University.

Pennsylvania Station.—A. K. Risser has resigned the position of assistant in agriculture in the station to accept an appointment in the Government Indian School at Lawrence, Kans. N. G. Miller, of the class of 1904, has been appointed as his successor.

Porto Rico Station.—F. D. Gardner, who has been in charge of the station since its organization, returned early in June and has assumed charge of the work in soil

management in the Bureau of Soils. Mr. Gardner was accompanied by O. W. Barrett, entomologist and botanist of the station, who will spend several weeks in visiting institutions of special interest in connection with his work. The station is constructing a small reservoir preparatory to making experiments in irrigation for special crops, including lowland rice. A bulletin on the propagation and marketing of oranges in Porto Rico is being published in both English and Spanish editions. This subject is attracting much attention in the island at present, and is one to which the station has given special attention. The growing of oranges on a commercial scale has commenced since the American occupation, and has not yet gone beyond the experimental stage. It is estimated that fully 6,000 acres of budded stock have been set out, and with the employment of suitable methods the outlook for successful and profitable orange growing in Porto Rico is thought to be very promising.

Rhode Island Station.—A. G. Lander, second assistant chemist, has resigned to accept a position in Providence, R. I.

South Carolina Station.—The veterinarian has undertaken to free the northern part of the State from cattle ticks, with a view to lowering the quarantine line.

Wyoming University and Station.—E. E. Slosson, for thirteen years professor of chemistry and chemist to the experiment station, who has been away most of the past year on leave of absence, has definitely severed his connection with the institution. He is at present located in New York as literary editor of the *Independent*.

New Greenhouses for the Department of Agriculture.—The location selected for the new Department building will require the tearing down of several ranges of greenhouses and frame structures used for potting and storage, and will ultimately necessitate the removal of the conservatories and all the greenhouses. An appropriation of $25,000 was made by the last Congress for constructing new houses and the removal of old ones to the new location which has been selected at the northwest corner of the Department grounds, adjoining Fourteenth and B streets NW. The site has been prepared by the removal of several large trees and the filling in of the lily pond. Eight new steel-frame greenhouses are now being constructed, and to these will be added three new ones of wood, the material for which is already on hand, and two comparatively new houses to be moved from their present location. A one-story brick building, about 275 feet in length, running along the north end of the greenhouses on B street, will serve as a potting house, carpenter shop, paint shop, and for storage of material, and will provide office rooms for those in charge of the greenhouse work. The new houses will be used largely for experimental work. They will take the place of those used for the physiological and pathological investigations, the seed and plant introduction work, the storage of plants for Congressional distribution, and the propagation of decorative plants. The new buildings will be ready early in September.

Recent Agricultural Progress.—This is the title of an address delivered by C. C. James, Deputy Minister of Agriculture for Ontario, before the Natural Science Association, and published in a recent issue of the *University of Toronto Monthly*. In this Professor James reviews the material and intellectual progress of agriculture in Ontario, and calls attention to the institutions for agricultural education and the benefits which are resulting from their work.

Referring to the agricultural college at Guelph, he says: "The first move made for improving Ontario agriculture was the establishing of the agriculture college in 1874. This was at the beginning of the period of depression, when the changed circumstances of the farmer were beginning to be severely felt. For many years the institution struggled against the harsh opposition of one political party and the half-hearted apologies of the other, and a certain disheartening indifference on the part of the farmers themselves. The work, however, was continued faithfully, though under the most discouraging conditions. In 1889 the attendance was 134, of whom 30 came from outside of Ontario. In each of the past two years the attendance has been

over 700. . . . There were, in 1889, two professors in the science department at $1,500 each, a professor of chemistry, and one professor for the following five subjects: Geology, botany, zoology, meteorology, and horticulture. Since then three fine laboratories have been erected and one rebuilt, and to-day ten members of the staff are required to cover the same work as the two of 1889. This is one illustration of the large place that scientific research and instruction have recently come to occupy in connection with agricultural work."

The farmers' institute system is described as an outgrowth of a university extension movement inaugurated in 1884, in order to bring the work of the college more directly to the farmer and to win his appreciation of it. Referring to the progress of these institutes, Professor James says: "Twenty years ago we discovered the farmer; five years ago we discovered that he had a wife; we are beginning to open our eyes to the fact that they have children. We have farmers' institutes, we have women's institutes. Where are the children's institutes? In the public schools. When we have worked out the rural public school course, and given the half-million children of farm homes all that can reasonably be given through public school work, we shall be making these children's institutes effective in their general upward movement. The rural public schools might and should be made the most important element in the permanent improvement of Ontario agriculture."

Professor James pays a high tribute to this Department, which he characterizes as "without doubt the largest and best equipped agricultural organization in existence. Its investigations are most varied, and the story of its working is more interesting than the latest work of fiction. It reaches out into all parts of the Continent, and its agents are to be found in all parts of the world. When housed in its new buildings, it will be the Mecca for all American students of the new agriculture."

National Diploma in Agriculture.—The annual examination for the national diploma in agriculture of Great Britain was held at Yorkshire College, Leeds, about the middle of May. Forty-six candidates were examined in the subjects comprised in part one (agricultural botany, mensuration and land surveying, general chemistry, geology, and agricultural entomology), and 25 candidates in part two (practical agriculture, agricultural bookkeeping, agricultural chemistry, agricultural engineering, and veterinary science). As a result of the examinations, 35 candidates passed part one and will be entitled to take the second part in 1905 or 1906; and 20 candidates passed part two, and are therefore entitled to receive the national diploma in agriculture. The candidates were from the various agricultural colleges throughout Great Britain. Of the 55 who passed part one or two, there was a total of 15 from Yorkshire College, 10 from Harris Institute at Preston, 6 from the West of Scotland Agricultural College, 6 from the Harper-Adams Agricultural College, 4 from the University College of Wales, 3 each from the Royal College of Science at Dublin, Durham College of Science at Newcastle-on-Tyne, and the Agricultural College at Holmes Chapel, and one each from the agricultural colleges at Uckfield and Aspartia, the South-Eastern Agricultural College at Wye, and the University at Aberdeen. Two women passed the examination in part one.

Association of Official Agricultural Chemists.—The annual meeting of this association will be held at St. Louis about September 20.

Miscellaneous.—The first annual commencement of the Dunn County School of Agriculture at Menomonie, Wisconsin, occurred May 27. The graduating class numbered 15, 5 of whom were girls. There were also 6 graduates of the short course.

C. L. Goodrich, in charge of the instruction in agriculture at Hampton Institute, has resigned his position and will sever his connection with the school at the close of the present year. He will be succeeded by E. A. Bishop, a graduate of the Massachusetts Agricultural College and for many years past in charge of the agricultural work at Talladega College, Talladega, Alabama.

At the recent jubilee of the University of Wisconsin, the degree of doctor of laws was conferred upon Hon. James Wilson, Secretary of Agriculture, and Dr. H. P. Armsby, director of the Pennsylvania Experiment Station. Secretary Wilson also received the same degree from Cornell College, at Mount Vernon, Iowa.

The honorary degree of doctor of engineering was conferred by Purdue University upon Elwood Mead, Chief of Irrigation Investigations in this Office and a graduate of the university.

Sir Henry Thompson, widely known for his work in dietetics, died at his home in London, April 18, 1904. He was born in Framingham, Suffolk, August 6, 1820, and was graduated in medicine with honors at the University College, London. He was the author of numerous papers on scientific and surgical topics, and two of his works on dietetics, Food and Feeding and Diet in Relation to Age and Activity, have gone through numerous editions and been widely read.

The agricultural and dairy building of the State Normal and Industrial School at Tallahassee, Fla., was destroyed by fire in April, together with most of the dairy equipment in the building. Plans are now being drawn for a more commodious and modern building to replace the one burned. Zachary T. Hubert, of Milledgeville, Ga., who graduates from the Massachusetts Agricultural College this year, has been elected professor of agriculture and science in the school.

The Board of Agricultural Studies at Cambridge University reports, according to a note in *Nature*, the continued progress of the department, which last term had 40 students. A number of field experiments have been instituted and are in progress on the university farm and in the adjoining counties, under the supervision of Professor Middleton and his staff.

According to a note in the *Daily Telegraph*, of Sydney, New South Wales, the establishment of a chair of agriculture at Sydney University is being advocated, and is under consideration by the minister of public instruction, the director of agriculture, and other prominent officials.

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EXPERIMENT STATION RECORD.

Vol. XV. July, 1904. No. 11.

This number concludes the fifteenth volume of the Record, except the index. The index number will, as usual, constitute No. 12, and the work on this has been kept so well up with the current numbers that it will be issued quite promptly. Special effort has been made in this direction for several years past, for it is recognized that the permanent value of the Record depends largely on its indexes, and that it is a great advantage to those who file it permanently to have the index in their hands as soon as possible after the conclusion of a volume.

The general index, which has been so long promised, has at length been issued. This has been in press since last September, and has suffered several unavoidable delays due to the shortage of some of the type used, as well as the usual delays incident to reading the proof. The manuscript was so ponderous that it was necessary to leave many matters to be attended to in the proof. This final work was made more difficult by the inability to have the whole index in type at one time. This was impracticable from a typographical standpoint. The plates were stereotyped as fast as the proof was read, so that the final changes necessitated cutting the plates or resetting, and hence had to be limited to those absolutely necessary to accuracy.

A large amount of time was expended in the effort to group entries, so that a subject would be found complete by persons approaching it from somewhat different points of view. There are always two and frequently more entries for each item, and cross references are used wherever it was thought they would be an aid. The result is a volume of six hundred and seventy-one pages, which furnishes a complete index to the work of the experiment stations and of this Department since the Hatch Act went into effect, and since about 1893 to the more important investigations of a similar character in foreign countries.

The range of subjects revealed by casually running over the index is hardly less surprising than the number of entries included under some of the larger subjects. The longest of these, Milk (and Milk production), occupies nearly eleven double-column pages; Soils, nine and a half pages; Corn, eight; Wheat, seven; Cows, six; and Butter

and Cheese four pages each. It is estimated that there are not far from one hundred and twenty-five thousand entries, arranged under fully fifty thousand headings and subdivisions.

The first edition of a thousand copies hardly more than sufficed to supply the college and station libraries and the heads of departments in the stations. As far as possible the chief assistants were also included, but a large number of regular recipients of the Record had to be left to be supplied from a second edition. As the latter under the present laws can not exceed one thousand copies, owing to the size of the volume, those who are as yet unsupplied and who especially desire it should have their names listed, as the further distribution will be upon application only. Many, doubtless, will not care particularly for this index, as they lack complete files or do not preserve the volumes in bound form.

The index is obviously of little value except to those who have complete sets of the Record, and one effect of its issue will doubtless be to stimulate attempts to complete broken files. No duplicates of the earlier volumes are now in stock at the Department, and very few of the later volumes. Occasional numbers can sometimes be supplied to help in completing volumes, but our ability to do this is dependent upon duplicates or discarded files which are returned to us. The attention of those who have incomplete sets or duplicates which they do not care especially to preserve is called to the fact that there is a constant call for back numbers from libraries, institutions, scientific workers and writers, and the like, which it is desirable to meet, and that such files or duplicates would be highly appreciated. We will be glad to send franks for the forwarding of such back numbers at any time, and will place them where they will do the most good and have a permanent value.

Two recent departures in the editorial line are worthy of notice on account of their novel character and the enterprise which they evidence. While totaly unlike, they are both typical of the thought which is given by American stations to the publication of their work and of the various efforts which are made to appeal to the farmer.

The Wisconsin Station has varied the usual form of the annual report this year, as it did ten years ago on the completion of its first decade. The present report is the twentieth. It summarizes the work of the station in its various lines from 1893 to 1903, the summaries being in the form of separate articles, each treating of a particular phase of the work. How concisely these summaries are made may be judged from the fact that the report does not exceed its usual size. In addition to them, the director contributes a brief history of the college of agriculture and the experiment station, and a description of the new agricultural building.

The advantage of such summaries and of discussing the accumulated results in the light of later information will be readily apparent. It serves as a convenient means for farmers to get a clear grasp of the work and its present status; and it also relieves the demand upon the station for its earlier reports, which are rapidly becoming exhausted. It places its work permanently on record in convenient form for reference.

Not every station could afford the time for such a summary perhaps; but some such periodical summing up of the work will be necessary as a permanent record, particularly where a station has accumulated a large amount of work on a variety of subjects. It is often a good thing for a station itself to try to point out exactly the ground it has covered, and the stage it has reached in its investigations. It clarifies the ideas of the workers and helps them to get their bearing in their work. If this could be done in some lines of experiments that have been allowed to drift along in a time-honored way, without even a careful summing up of the yearly results, chiefly on account of the supposed value of their cumulative results, it is quite possible we should lose our reverence for them and evolve something more promising.

The requirement of an annual report is a wise one, as well for the station and its workers as for the general public. The decennial summary has many things to commend it, and will become the more important with the flight of time.

The second editorial venture to which it is desired to call attention is that of the agricultural college and experiment station of Tennessee which recently undertook the editorial management of a daily newspaper, Prof. Andrew M. Soule, the director, appearing in the rôle of editor of the *Knoxville Sentinel* for its issue of June 3d. The object was to attract attention to the work of the college and station, and the immediate occasion was the East Tennessee Farmers' Convention, which held its final session on that date.

Many of the papers presented at the convention were reproduced, and to these were added various articles relating to agricultural education, the work of the experiment station, and the application of the results in practice to improve Tennessee agriculture, written by members of the station staff. An article by Prof. C. S. Plumb, of Ohio State University, summarized the results of feeding trials with hogs, and one by M. A. Carleton, of this Department, discussed the improvement of winter cereals for the South.

The editorial page was essentially agricultural throughout. There were editorials on Agricultural Opportunities in Tennessee, The Farm Home, The Value of Good Roads, More Reading Farmers, Sweet Clover and Alfalfa Bacteria, and Trained Farm Foremen in

Demand. The usual short notes on this page gave bits of information upon agricultural topics, agricultural statistics, etc.

The management of the paper explains in a note that "in turning its columns over to the farmers for to-day the *Sentinel* thus recognizes the great importance of agriculture, surpassing that of all other factors in our industrial activities. The development of better methods of farming in our section will more than aught else promote our wealth and progress. Professor Soule has given his best efforts to this edition, and we believe it will be found to reflect great credit on him, and we trust also upon the *Sentinel*."

This undertaking is as interesting as it is novel, and the result is certainly most creditable.

We publish in this issue a description of the respiration calorimeter as adapted to use with animals. Editorial mention of this apparatus and its significance to investigation in animal nutrition has already been made (E. S. R., 15, p. 737). In view of the interest attaching to the apparatus both from its intrinsic importance and on account of its American origin, a popular description of its construction seemed desirable. Doctor Armsby consented to prepare such a description, the first of the kind which he has published; and to this he has added some remarks on the way in which the apparatus is employed in studying questions in animal nutrition, and the interpretation of the results with reference to the demand for nutrients and the use to which they are put by the animal organism. This will doubtless prove helpful to many who have not given special attention to the subject, and make more evident the important function of the apparatus.

THE RESPIRATION CALORIMETER AT THE PENNSYLVANIA EXPERIMENT STATION.

H. P. Armsby, Ph. D., LL. D.,

Director Pennsylvania Experiment Station.

Our present methods of investigating the problems of stock feeding are still very largely based upon the classic investigations of Henneberg and Stohmann at the Weende Experiment Station, covering approximately the years from 1858 to 1870. Beginning with investigations upon the digestibility of feeding stuffs and upon the maintenance requirements of farm animals, they subsequently took up more complex problems. A respiration apparatus modeled after that of Pettenkofer at Munich was constructed, and somewhat extensive respiration experiments with both cattle and sheep were conducted. No more carefully thought out, complete, and logical programme for investigations in animal nutrition is on record than that written by Henneberg in 1868 and published in 1870 as an introduction to his "Neue Beiträge."[a] This paper outlines the general features of the problem and will well repay careful perusal by every student of the subject.

Such investigations as Henneberg mapped out, however, are necessarily slow and expensive, particularly in the case of farm animals, and while the respiration apparatus found extensive use by the physiologists for smaller animals, investigators of feeding problems were largely content for many years with the simpler methods of digestion and metabolism experiments. It is only quite recently that the investigations of Kühn and Kellner at Moeckern and of Zuntz and Hagemann at Berlin have aroused new interest in these fundamental questions. In the United States the work of the experiment stations has almost of necessity been along lines similar to those pursued for many years abroad. While the investigations of our stations have done much to advance our knowledge of the subject of stock feeding, especially as related to questions of practice, they have at the same time made increasingly evident the need for more scientific study of

[a] Ueber das Ziel und die Methoden der auf den Landwirthschaftlichen Versuchsstationen auszuführenden thier-physiologischen Untersuchungen.

the fundamental physiological laws upon which a rational practice must necessarily be based.

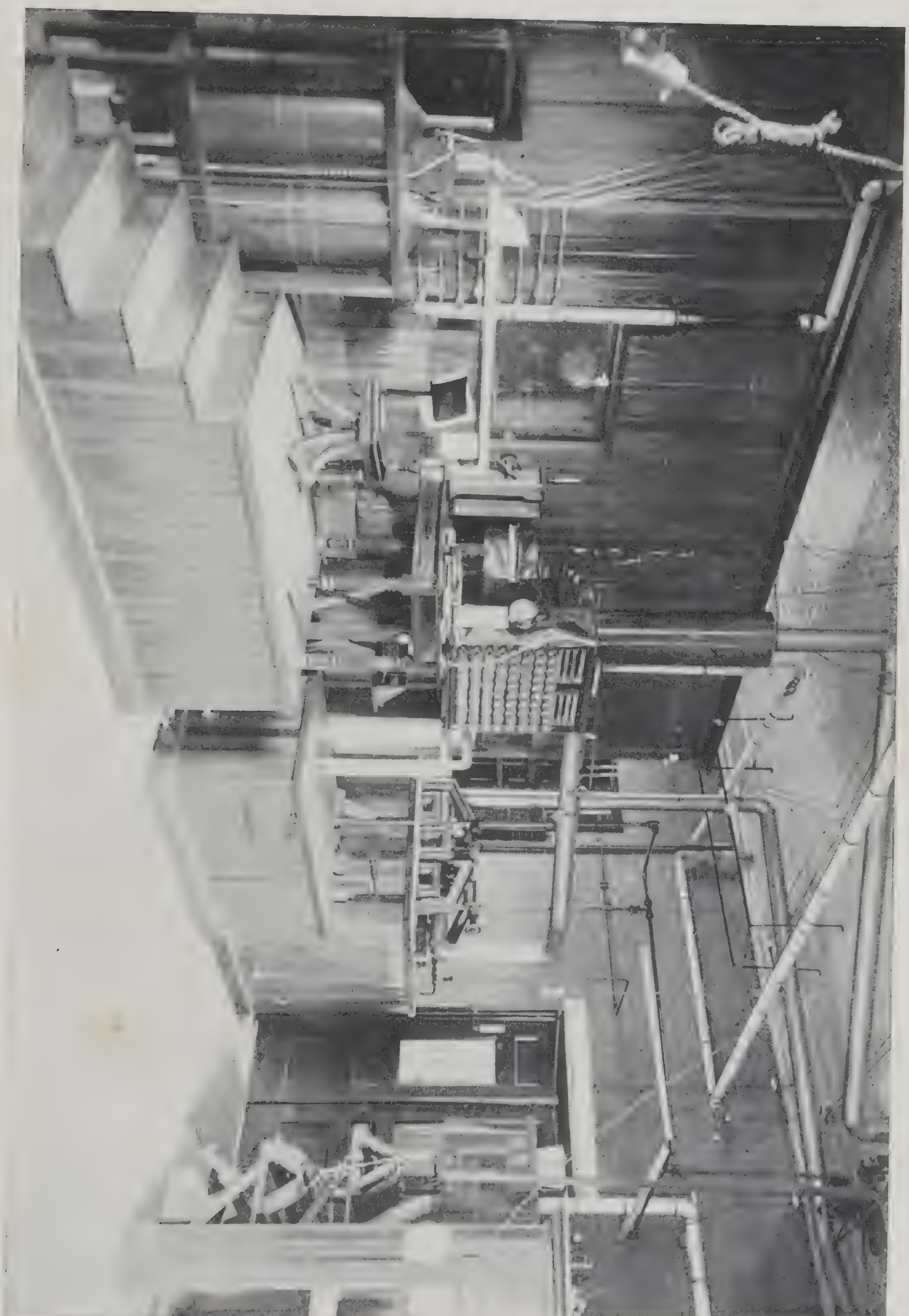
In 1898, encouraged by the success which had attended the investigations with the Atwater-Rosa respiration calorimeter at Wesleyan University, the Pennsylvania Experiment Station and the Bureau of Animal Industry of the U. S. Department of Agriculture undertook in cooperation the construction and operation of a similar apparatus for studying the fundamental principles of the nutrition of farm animals (Pls. IV and V). It was determined to make the apparatus large enough for experiments with cattle, and in view of the costly and unique nature of the apparatus the erection of a special building for housing it was authorized by the trustees of the college.

Work upon the apparatus was begun in the fall of 1898. In addition to the numerous problems of construction involved in the considerable enlargement of the apparatus, other questions had to be solved. Thus, no cooperation could be had from the subject of the experiment, but everything relating to the conditions inside the apparatus must be adjustable by the observer without. Moreover, for experiments with cattle large amounts of bulky food and excreta had to be introduced into or removed from the apparatus. A further complication arose from the considerable production of combustible gases by ruminating animals, rendering it necessary to provide special means for their determination. As a result of all these difficulties, the construction proved slower and more expensive than was anticipated, extending over nearly three and one-half years. Preliminary tests were completed and the first actual experimental work begun early in the year 1902.

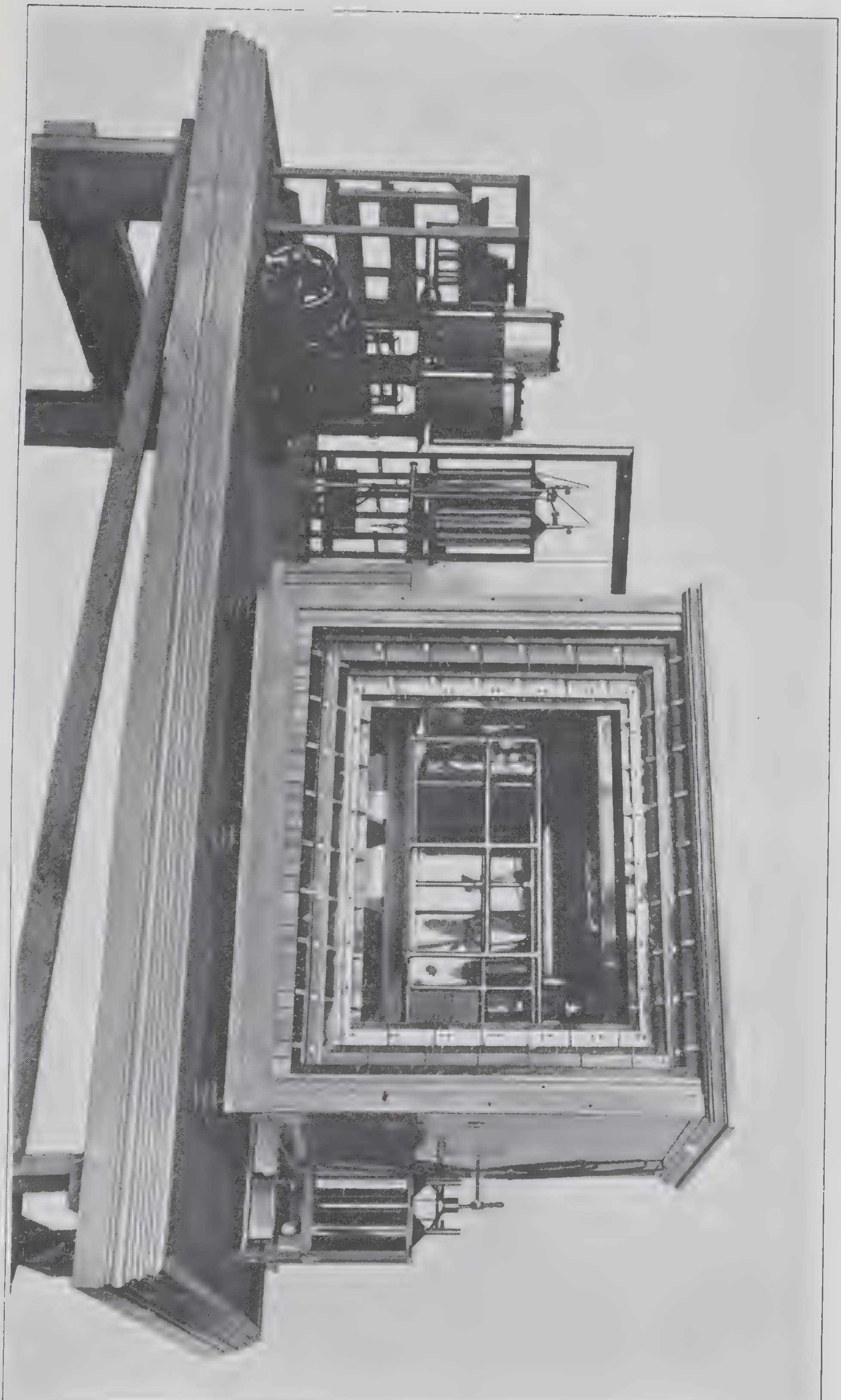
GENERAL PLAN.

The general plan of the apparatus is substantially that of the Atwater-Rosa apparatus; that is, it is a Pettenkofer respiration apparatus, the chamber of which serves also as a calorimeter. The original Middletown apparatus has been fully described in bulletins 63 and 136 of the Office of Experiment Stations, and the reader is referred to these publications for details on many points.

The respiration chamber of the Pennsylvania apparatus (figs. 11 and 12) is constructed of sheet copper, and measures 6 feet by 10 feet 4 inches and 8 feet high. A platform 21 inches above the base of the chamber carries the stall in which the animal stands. Beneath the rear portion of this stall is a small chamber of sheet copper about 34 by 67 inches, entirely shut off from the rest of the respiration chamber except for two holes through the platform, and having a separate air-tight door. Through one of the holes mentioned a rubber tube leads from the urine funnel to a receptacle of tinned copper; to the other hole is attached a large rubber duct covering the hind quarters of the



THE RESPIRATION CALORIMETER.



MODEL OF RESPIRATION CALORIMETER, SHOWING GENERAL PLAN AND DETAILS OF CONSTRUCTION.

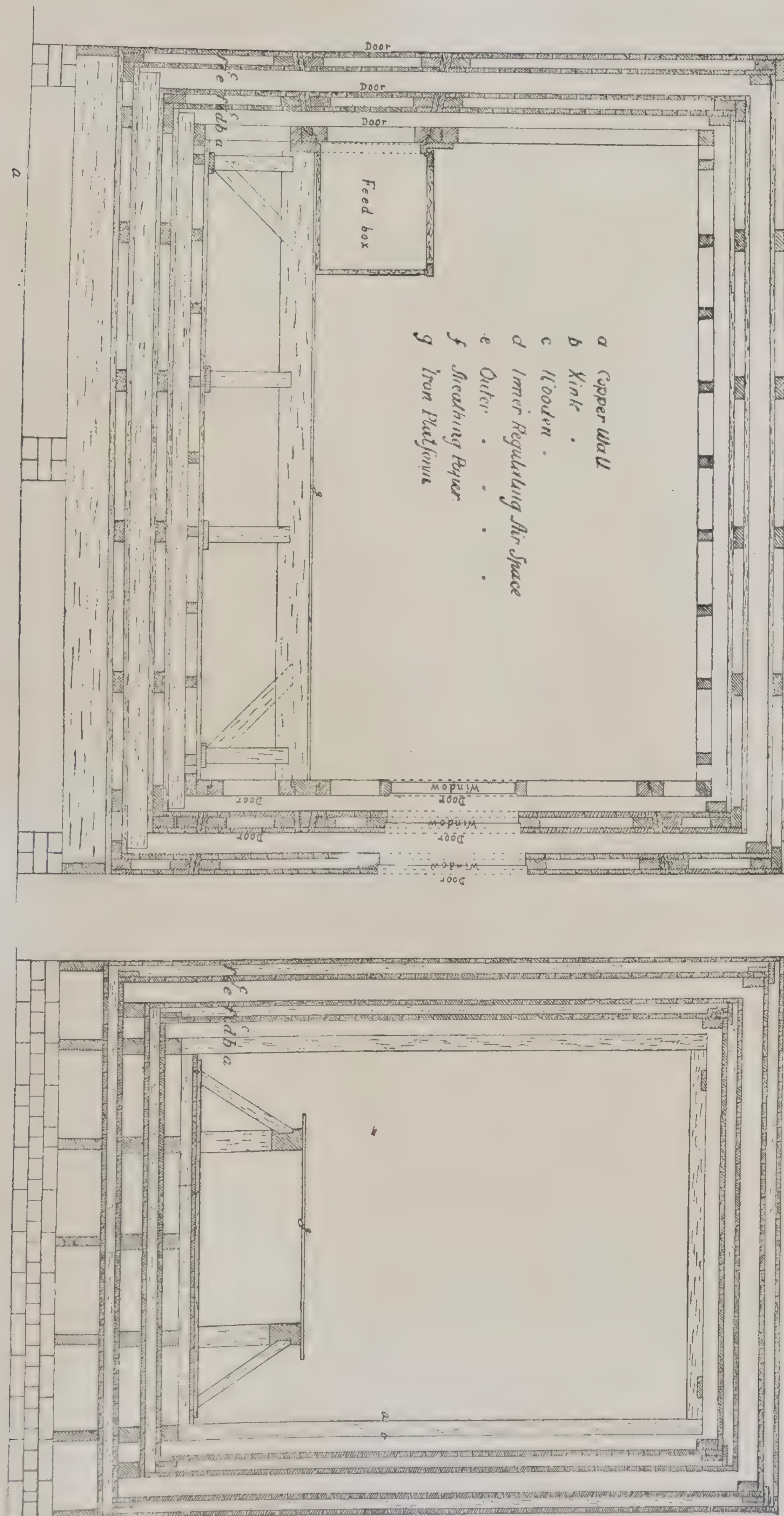


FIG. 11.—Vertical cross section.

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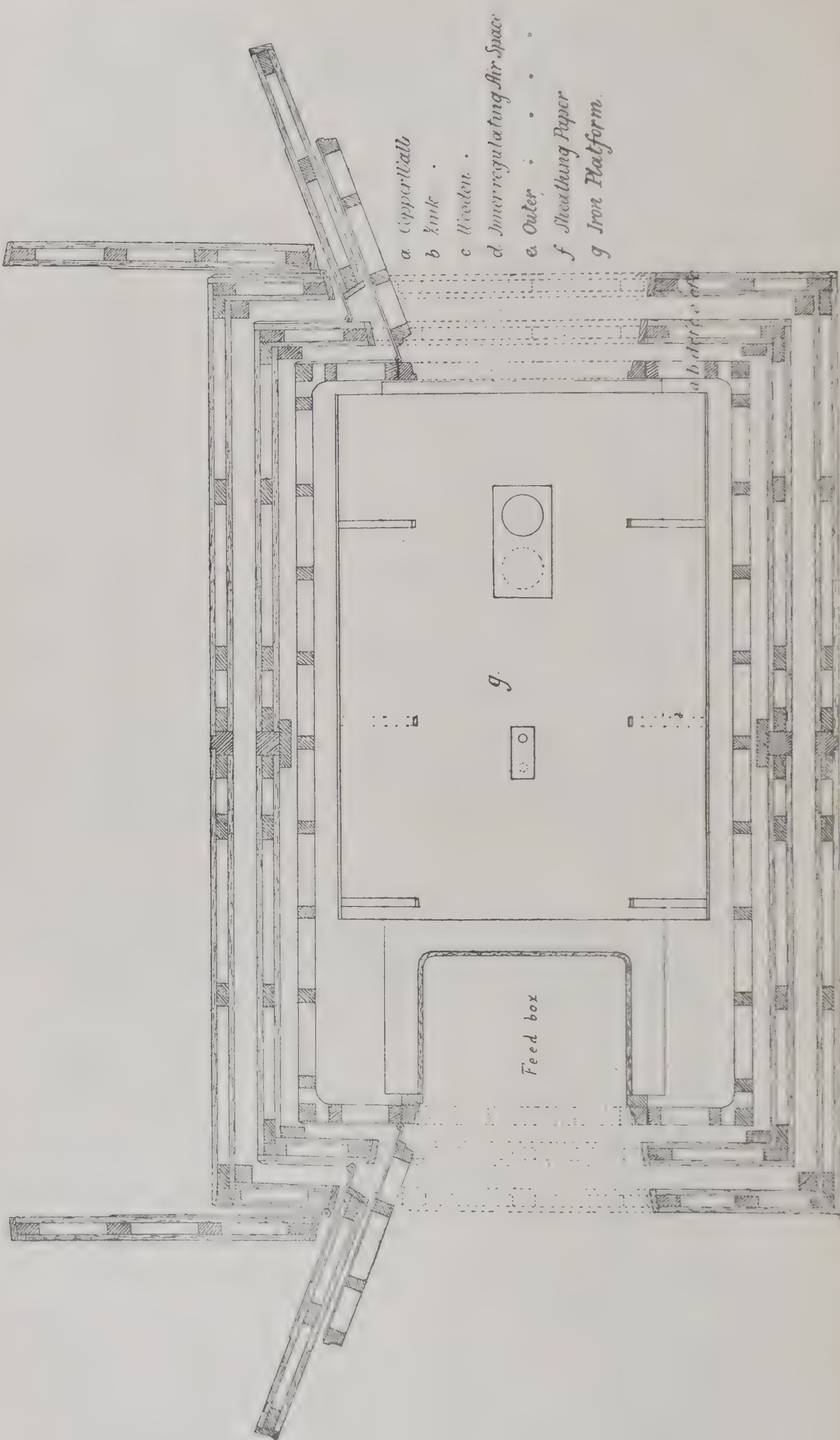


FIG. 12.—Horizontal cross section.

animal, and underneath it is placed a galvanized iron box, tightly pressed against the lower side of the platform, to receive the droppings of the animal. This small chamber, therefore, has only such air connection with the remainder of the chamber as is unavoidable through the openings around the two ducts, but is in thermal communication with it through its copper walls. The operation of opening the air-tight door, removing the excreta and replacing the receptacles occupies not more than a minute or two, and it is assumed that any error thus introduced is insignificant.

At the other end of the platform is the feed box. This is provided with an air-tight cover, which can be opened or closed by means of a lever operated from outside, and is also provided with an air-tight door. By lowering the cover the feed box can be entirely shut off from the chamber. The air-tight door can then be opened for the introduction of feed or the removal of residues, the door closed and the lid again lifted. The arrangement constitutes, in brief, an air lock and is substantially like that employed in the respiration apparatus of the Moeckern Experiment Station. The water supply is introduced into a small drinking basin at the side of the feed box by means of a pipe carried through the calorimeter wall, the water being weighed in and any excess removed by drawing the water in the pipe down to a fixed level.

The large door at the rear of the apparatus through which the animal enters and the two small doors giving access respectively to the feed box and excreta have heavy oak frames and are made tight by means of gaskets composed of rubber tubing, the doors being kept in place by means of pressure catches such as are frequently used on large refrigerators.

THE RESPIRATION APPARATUS.

Through the chamber above described a current of outdoor air is aspirated by means of a special pump (Pl. VI), the air first passing over the expansion coils of an ice machine where most of its moisture is deposited as frost. At the point of entry to the chamber samples are taken alternately by one or the other of two large aspirators of constant flow at the rate of 200 liters in 12 hours. In these samples moisture and carbon dioxid are determined by passing them through U tubes containing sulphuric acid and soda-lime.

The air leaving the respiration chamber passes first through four large copper cans, standing in wells in a brine bath which is cooled to about -20° C. by means of the ice machine. In these cans the larger share of the moisture of the outcoming air condenses as frost and is subsequently weighed.

From the copper cans the air passes to the meter pump, which serves both to maintain the air current and to measure and sample it.

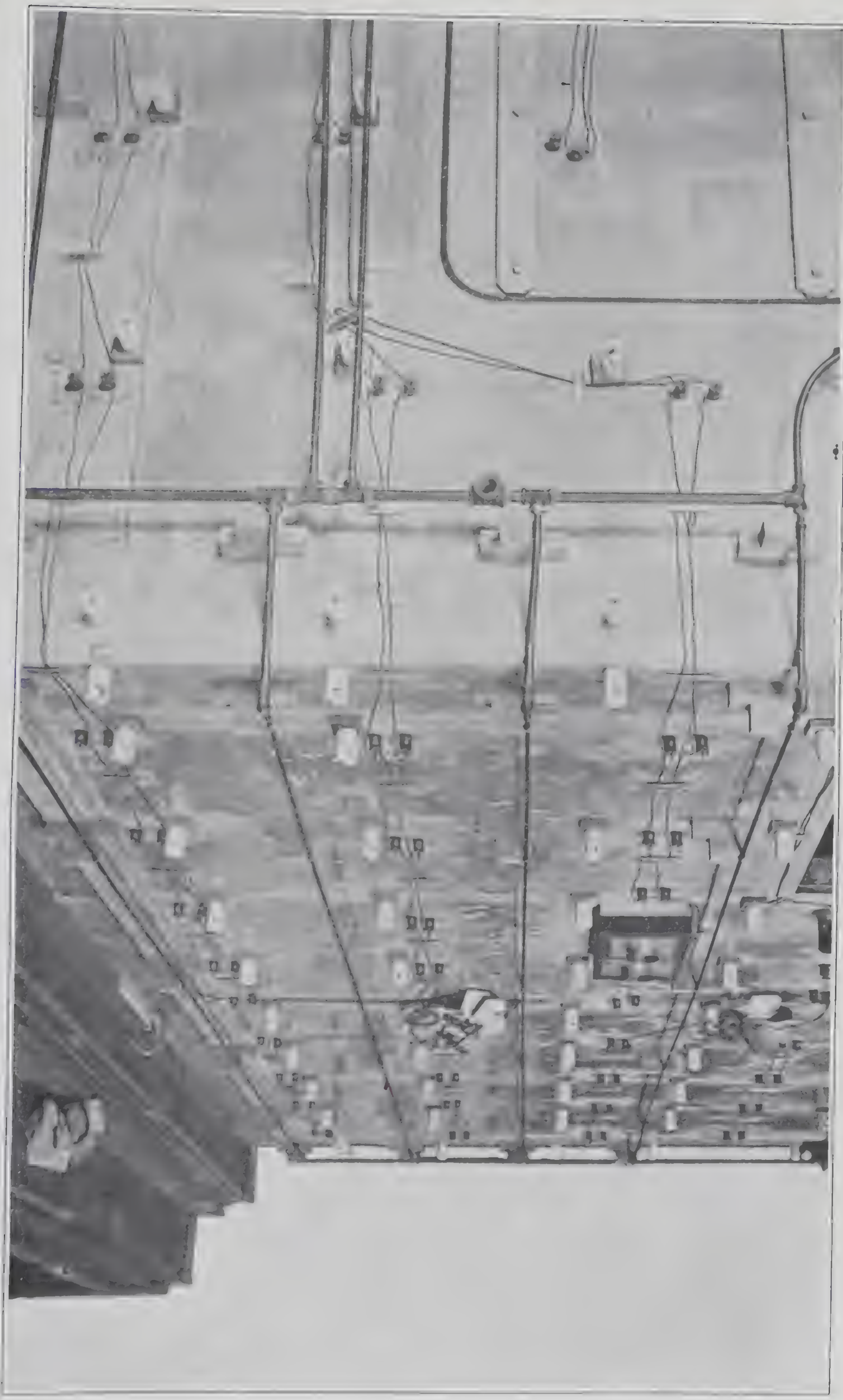
This meter pump, which was designed and built especially for this apparatus by Mr. Frederick Hart, of Poughkeepsie, New York, acts upon the same principle as the Blakesley meter pump used in the Atwater-Rosa apparatus, but differs materially from it in mechanical details. A full description of it has been published.[a] The pump consists essentially of two cylinders of drawn-steel tubing, 19 inches in diameter, moving up and down in mercury. The pump is adjustable to three different lengths of stroke and four speeds. As thus far used, it has been set to deliver approximately 50 liters per stroke (exactly, 49.539) and has been run at the rate of about 14 strokes per minute, the total ventilation, therefore, being about 700 liters per minute. The number of strokes as recorded by a revolution counter, with the corrections for temperature and pressure, gives the total volume of air passing through the apparatus, and the results of the analysis of the ingoing air, calculated upon this volume, give the weights of water and carbon dioxid carried into the apparatus by the current of air.

By means of a shunt valve connected with an ingenious train of gearing, one stroke is delivered at regular intervals alternately through one or the other of two special outlets. The pump can be set to deliver thus one stroke in 200, one in 400, or one in 800. The two aliquot samples thus taken are conducted to two large pans having counterpoised rubber covers substantially like those used in the Atwater-Rosa apparatus. From these pans each sample separately is aspirated by means of a subsidiary air pump and passes through a set of six large U tubes ($10\frac{1}{2}$ inches), the first two containing pumice stone saturated with sulphuric acid, the second two soda lime, and the last two pumice stone and sulphuric acid. The increase in weight of these tubes, of course, gives the amounts of water and carbon dioxid contained in the samples, and this amount multiplied by the proper factor gives the total amount contained in the outcoming air. Subtracting from this that contained in the ingoing air, determined as above described, gives the amounts added by the animal.

From the U tubes the air is conducted to the apparatus for determining the combustible gases excreted. This consists of a 1-inch copper tube, having an effective length of about 60 inches, filled with platinized kaolin and kept at a red heat by 64 gas-burners. In this tube the combustible gases are oxidized to carbon dioxid and water, which are absorbed and weighed in a second set of U tubes similar to the first. Many difficulties were experienced in securing satisfactory results with this part of the apparatus on account of the large volume of air to be handled ($3\frac{1}{2}$ liters per minute as ordinarily used) and the considerable force required to draw the air through the numerous absorption tubes. The connections with the combustion tubes are

[a] American Machinist, 25 (1902), p. 1297.

THE METER PUMP AND ABSORPTION TUBES.



ARRANGEMENT OF HEATING WIRES, COOLING PIPES, ETC.

made with soldered joints and the absorption tubes are carefully tested with the manometer before being used. The amount of platinized kaolin employed has been demonstrated to be sufficient to oxidize much larger amounts of methane than it will ever be required to in actual use.

No parallel determinations of combustible gases are at present made in the air entering the apparatus. The amounts have been shown to be very small in this locality and corrections are made for them from the results of numerous blanks.

THE CALORIMETER.

The arrangements for determining the heat given off by the animal are in all essentials like those of the Atwater-Rosa apparatus. The heat is absorbed by a current of cold water passing through copper pipes at the top of the respiration chamber, access of air to these pipes being regulated by means of shields which can be raised or lowered by the operator. The temperature of the ingoing and outcoming water is read every four minutes by means of two mercurial thermometers, graduated to $\frac{1}{50}$° C. and carefully calibrated. The volume of water passing through is measured by means of two copper meters, each containing 100 liters. The apparatus is so arranged that the weight of the heat absorbers may be taken from outside, any condensation of moisture upon them being thus indicated.

The respiration chamber proper of the apparatus is a metallic chamber of the dimensions stated above. Surrounding this, with an air space of 4 inches between, is a double wooden wall, which in turn is surrounded by a second wall and air space of 4 inches. The walls of the respiration chamber proper are double, the inner of copper and the outer of zinc, with a 3-inch dead air space between, and through these walls are distributed some 600 iron German-silver couples connected in series with a reflecting galvanometer and serving to indicate any difference in temperature between the inner (copper) and outer (zinc) surface. Any such difference is rectified and the walls of the chamber maintained adiabatic by heating or cooling the air space surrounding the zinc wall—the former by means of an electric current through resistance wires and the latter by circulating cold water through brass pipes (Pl. VII). The double wooden wall surrounding the metallic chamber also contains a smaller number of iron German-silver couples, and is in its turn kept nearly adiabatic by regulating the temperature of the second air space. By means of very similar devices, the temperature of the ingoing air is maintained the same as that of the outcoming air.

The temperature of the interior of the apparatus is measured by means of a series of copper resistance thermometers connected to a slide-wire Wheatstone bridge, and also by means of two mercurial thermometers. By raising or lowering the shields or varying the flow

of water through the absorbers, the rate at which heat is removed through the water current may be so regulated as to keep the temperature of the interior constant within very small limits, while the slight variations are made to balance each other in the course of an experiment, so that there is practically no capacity correction. Under these conditions, all the heat evolved by the animal must leave the apparatus either as sensible heat in the water current or as the latent heat of water vapor.

In practice, of course, corrections have to be made for any heat introduced or removed as sensible heat in the feed, excreta, etc. The friction of the water in the coil of copper pipes is also the source of a minute amount of heat, which is computed from the volume of water and the fall in pressure in passing through the pipes. This difference in pressure also affects slightly the readings of the thermometers, tending to make those in the ingoing water relatively higher than those in the outcoming water. The small correction for this difference has been determined experimentally within the range of pressures used.

BUILDING.

The building in which the apparatus is housed is of brick, with heavy walls containing an air space to aid in maintaining uniform temperature. The floor is of concrete, the ceiling high enough to leave about 3½ feet clear space above the top of the respiration chamber, which stands upon three brick piers about 18 inches above the floor of the room. In this way any difficulty arising from differences in temperature at different points in the room has been avoided.

EXPERIMENTS.

The experiments thus far made have been of 48 hours' duration, this period being subdivided into subperiods of 12 hours each. The animal is placed in the apparatus 5 or 6 hours before the beginning of the experiment, which has been conveniently placed at 6 p. m. By this time the apparatus has come into equilibrium, and it is only necessary to shift the current of air from one set of cans and absorption apparatus to another in order to begin the experiment.

The experiments have followed each other at an average interval of from two to three weeks. During the intervening time the animal stands in an adjoining room in a stall which is provided with appliances for the quantitative collection of the visible excreta. An actual experiment requires the services of at least seven men, exclusive of the assistant in charge of the feeding and collection of excreta. Three series of experiments have thus far been made, the results of the first of which have been recently reviewed in these pages (E. S. R., 15, p. 799).

INTERPRETATION OF RESULTS.

A feeding experiment conducted with the aid of the respiration calorimeter is not fundamentally different from one made according to simpler and more familiar methods. In both cases we attempt to compare the results obtained, either from two or more rations under identical conditions or from identical rations under differing but controlled conditions. The difference lies in the extent to which we are able to control the conditions and in the accuracy and minuteness with which it is possible to compare the rations and their results.

The simplest and most obvious form of feeding experiment is that in which the amounts of feed consumed are noted and their effects measured by the increase in the live or dressed weight of the animal or by the weight of milk or wool produced. This method, when skillfully carried out with a considerable number of animals and under the conditions of actual practice, is particularly adapted, and indeed may be said to be indispensable, to the study of the economic aspects of stock feeding.

But while this is true, it is also the fact that no considerable or profound knowledge of the principles of feeding can be gained by means of experiments of this class. The factors entering into the problem are too complex. Chemistry has shown that each one of the feeding stuffs consumed consists of a great variety of substances—useful, indifferent, and even injurious—mingled in the most diverse and varying proportions, while physiological investigation has demonstrated not only the considerable and irregular fluctuation of live weight from day to day, but especially that a given increase or decrease may be of very varying significance according as it consists of proteid tissue, fat, mineral matter, or simply water. The result of a live-weight experiment, therefore, may be the resultant of any one of many possible combinations of these factors, and no safe conclusion as to its actual cause is usually possible. The history of this class of experiments amply corroborates this conclusion. Great accumulations of experimental data have been made, but relatively few general conclusions have issued from them.

The earliest step in advance was the attempt to separate the factor "food" into its elements. Of these attempts the one which has secured general acceptance is the familiar one of Henneberg which groups the chemical ingredients of feeding stuffs into "protein," "carbohydrates," "fat," and "ash," subdividing the carbohydrates into "crude fiber" and "nitrogen-free extract," and distinguishing further between the digestible and the indigestible portions of each group. A great mass of investigation along these lines in the laboratory and digestion stall has materially enlarged our knowledge of feeding stuffs, although much still remains to be done. It is now a comparatively easy matter, by the familiar methods of the digestion

experiment, to determine with a fair degree of accuracy the so-called "digestible nutrients" consumed in the several periods of a feeding experiment and thus to secure a more rational basis of comparison. To the conventional determinations it is of course easy to add others, such as that of amids, pentosans, etc., and particularly the heat of combustion.

A knowledge of the elements of the food consumed, however, is the smaller half of the problem. It is necessary to secure some definite and accurate measure of its effects upon the animal consuming it. This has been the weak side of investigation in stock feeding. While much labor has been expended in determining the composition and digestibility of feeding stuffs with scientific accuracy, too many experimenters have been, of choice or necessity, content to limit their determinations of nutritive effect to simple weighing of the product. As a consequence, the expenditure in the examination of the feeding stuffs has, as a whole, failed of its due reward through lack of the other term of the comparison. This is less true, of course, of experiments on milk production, since in these the material product may be subjected to chemical and physical examination, but even here half or two-thirds of the food may serve to support those nutritive functions of the body whose net result is expressed in the term "maintenance," but of whose amount and character the live-weight experiment furnishes no exact measure.

The problem is to determine the changes in the make-up of the body during an experiment. Two general methods have been applied to its solution.

The first is the method of comparative slaughter tests. Of two animals or lots, selected for their apparent identity as to weight and condition, one is killed and analyzed at the beginning of the experiment and the other at its close, and the difference in the amounts of the several ingredients found is regarded as representing the gain made by the second animal or lot. The weak point of the method, of course, aside from its laboriousness, is the impossibility of proving the fundamental assumption of identity of composition of the two animals at the beginning of the experiment.

The second method, which especially interests us here, dispenses with any knowledge of the initial composition of the animal and attempts to determine directly the increment or decrement of each important ingredient of the body during the experiment. The basis of the method is Henneberg's conception of the schematic body. This is, in brief, that for this particular purpose the animal body may be regarded as composed of water, ash, protein, and fat, each of practically invariable elementary composition. The writer has discussed this conception at some length elsewhere,[a] and it seems sufficient here

[a] Principles of Animal Nutrition, pp. 60–66.

to simply state the average composition of the protein and fat of cattle, from which that of other species differs but slightly.

Composition of protein and fat of cattle.

	Protein.	Fat.
	Per cent.	*Per cent.*
Carbon	52.54	76.50
Hydrogen	7.14	11.91
Oxygen	23.12	11.59
Nitrogen	16.67	....
Sulphur	.52	....
	100.00	100.00

According to this conception the effect of a ration is expressed by the gain or loss of ash, protein, fat, and, of course, water, by the body of the animal, and this gain or loss may be determined by comparing the amounts of ash, nitrogen, and carbon in the food with those contained in the various excreta, solid, liquid, and gaseous; that is, by a so-called balance experiment. As regards ash, the method is sufficiently obvious, and the principal interest centers in the methods for the organic ingredients, viz, protein and fat.

Since the term protein, as above used, is synonymous with total nitrogenous matter, the gain or loss of protein may be determined by a comparison of the income and outgo of nitrogen. Furthermore, since the vast majority of physiologists regard it as demonstrated that there is no material excretion of gaseous nitrogen by the body we may confine the determinations of nitrogen to the food and the visible excreta. For example, in two experiments with a steer, in which the rations consisted, respectively, of 4,531 grams and 5,750 grams of timothy hay, with the addition in each case of 400 grams of linseed meal, the following figures for daily nitrogen were obtained as the average of a ten-day period following a preliminary period of eleven days:

Nitrogen balance in two periods of a feeding experiment with a steer.

	Period A.		Period B.	
		Grams.		*Grams.*
Nitrogen in hay		23.4		32.5
Nitrogen in linseed meal		22.2		22.1
Nitrogen, total in feed		45.6		54.6
Nitrogen in feces		16.2		20.8
Nitrogen digested		29.4		33.8
	Grams.		*Grams.*	
Nitrogen in urine	36.3		33.7	
Nitrogen in hair, etc	1.3		1.3	
		37.6		35.0
Loss of nitrogen by body		8.2		1.2

In Period A the outgo of nitrogen is shown to have exceeded the income by 8.2 grams. Multiplying this by the factor 6.0 (corresponding to 16.67 per cent. nitrogen) we find that in this period the steer

oxidized 49.2 grams of the proteid tissues of his body in addition to 146.8 grams of proteids and 16.3 grams of nonproteids which he was shown to have digested from his feed. In Period B the loss of proteids was only 7.2 grams on a ration containing in digestible form 173.2 grams of proteids and 17.2 grams of nonproteids. In other words, the second ration diminished the loss of proteids by the body by 42.0 grams, while it supplied only 26.4 grams more of proteids than that of Period A. This striking result is readily explained as the effect of the large addition of nonnitrogenous matter in Period B, but it serves to illustrate the difficulty of drawing *a priori* conclusions as to the effects of a ration.

The animal body, however, usually contains relatively considerable amounts of fat, and the quantity of the latter is subject to much greater fluctuations than that of protein. The change in the store of fat in the body is usually the most conspicuous effect of a ration. The determination of its amount requires, in addition to the nitrogen balance, a determination of the income and outgo of carbon, including, therefore, a determination of the gaseous products of respiration and perspiration by means of some form of respiration apparatus.

In the two periods whose nitrogen balance has just been given, the respiratory products were also determined for 48 hours by means of the respiration calorimeter, affording, along with determinations of carbon in feed and excreta, data for the following daily comparisons:

Income and outgo of carbon.

	Period A.		Period B.	
	Income.	Outgo.	Income.	Outgo.
	Grams.	*Grams.*	*Grams.*	*Grams.*
Carbon of hay	1,337.6		1,876.8	
Carbon of linseed meal	172.5		170.7	
Carbon of feces		649.8		858.0
Carbon of urine		88.1		101.3
Carbon of carbon-dioxid		934.1		1,075.6
Carbon of methane		55.2		70.4
Carbon of hair, etc		8.0		8.0
Carbon lost by body	225.1		65.8	
Total	1,735.2	1,735.2	2,113.3	2,113.3

In Period A we have already computed a daily loss of 49.2 grams of protein. This protein contains 52.54 per cent of carbon, equal to 25.9 grams, while the total loss of carbon, as shown above, was 225.1 grams. The difference of 199.2 grams must, therefore, according to our basal assumption regarding the make-up of the schematic body, represent a loss of fat, and since this fat contains 76.5 per cent of carbon, the loss of 199.2 grams is equivalent to the loss of 259.0 grams of fat. In precisely the same way, we compute the loss of fat in Period B to be 80.6 grams.

The net results in these two periods, then, may be summarized as follows:

Balance of nutrients.

	Period A.	Period B.
	Grams.	*Grams.*
Proteids digested	146.8	173.2
Total organic matter digested	1,831.1	2,539.7
Protein lost by body	49.2	7.2
Fat lost by body	259.0	80.6

In other words, the increase of 708.6 grams in the organic matter digested in Period B took the place of 42.0 grams of body protein and 178.4 grams of body fat oxidized on the lighter ration; that is, these latter figures represent the contribution which the added hay made to the maintenance of the body.

Still another method of comparison is afforded when we turn from considering the food as a supply of matter and regard it as the source of energy to the vital machinery.

The potential energy of feed and of visible excreta is measured by their heats of combustion, which are readily determined by means of the bomb calorimeter. The production of heat by the animal is determined directly by the respiration calorimeter. Adding to these data the heat of combustion of the methane excreted, which is readily computed from its amount, we have all the data for the construction of a balance of energy similar to the balance of matter. In the two cases selected as examples this was:

Balance of energy.

	Period A.		Period B.	
	Income.	Outgo.	Income.	Outgo.
	Calories.[a]	*Calories.*[a]	*Calories.*[a]	*Calories.*[a]
Energy of hay	13,035		18,463	
Energy of linseed meal	1,824		1,811	
Energy of feces		6,432		8,574
Energy of urine		853		965
Energy of methane		984		1,253
Energy of hair, etc		88		88
Energy of heat produced by steer		9,215		10,296
Loss of energy by steer	2,713		902	
Total	17,572	17,572	21,176	21,176

[a] The calorie here used is the large calorie (kilogram-calorie), usually written with a capital C.

In Period A, out of a total of 14,859 calories of energy in the food 8,357 calories reappeared as unused potential energy in the various excreta. The remainder, 6,502 calories, was used to support the vital activities of the body, and these required in addition 2,713 calories of energy, which was supplied by the oxidation of body tissue. The 49.2 grams of protein lost by the body would supply for this purpose 280 calories and the 259 grams of fat 2,461 calories, or a total of 2,741 calories, which is practically the same as the amount computed from the energy balance.

In Period B the energy of food, minus excreta, is 9,394 calories, and the contribution from body tissue 902 calories (or 807 calories as computed from the loss of protein and fat), making a total requirement of 10,296 calories of energy, which was evolved by the body as heat.

A comparison of the two periods shows that the extra hay given in Period B supplied, after deducting the losses in the excreta, 2,892 calories more of energy for the uses of the body and that this diminished the draft on the body tissues for energy by 1,811 calories. In round numbers, then, 63 per cent of the added energy was available to diminish the loss of tissue—that is, for maintenance.

Our final comparison of the two periods, then, takes the following form, in which, for convenience, the losses are expressed as negative gains:

Gains or losses in the animal body.

	Period A.	Period B.	Difference.
Food:			
Proteids digested ....grams..	146.8	173.2	26.4
Total organic matter digested ....do....	1,831.1	2,539.7	708.6
Energy supplied ....calories..	6,502	9,394	2,892
Body changes:			
Gain of protein ....grams..	− 49.2	− 7.2	42.0
Gain of fat ....do....	− 259.0	− 80.6	178.4
Gain of energy ....calories..	−2,713	−902	1,811

The object of these two periods was to ascertain the actual feeding value, under the conditions of the experiment, of 1,219 grams of timothy hay added to the ration of Period A. This we determine, just as in the simplest feeding experiment, by trying it and noting the results, and the value of the latter depends as absolutely in the one case as in the other upon the maintenance of uniform and normal conditions of experiment, both external and internal. The difference is simply that by means of more refined methods we have been able to make a more detailed, definite, and accurate comparison of results.

It is evident that the same general method is equally applicable to experiments in which an actual gain is made by the animals, and that the kind and amount of gain made may be accurately compared with the supply of matter and energy in the food used to produce it. In fact a large amount of work along this line has been done by Kellner and his associates, a consideration of which would lead us too far afield. In general, the method opens the prospect of being able to predict with a good degree of accuracy the amount and kind of gain, or, otherwise expressed, the amount of energy storage in the body which may be anticipated from the consumption of a given amount of matter or energy in this or the other feeding stuff, while it also enables us to formulate the demands of the vital processes for energy and measure the extra expenditure of the latter required in the digestion and assimilation of the coarser as compared with the more concentrated feeds.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

On the determination of the citric-acid soluble phosphoric acid in Thomas slag, R. Sorge (*Ztschr. Angew. Chem., 17 (1904), p. 393; abs. in Chem. Ztg., 28 (1904), No. 33, Repert. No. 9, p. 116*).—In studies of Kellner's method for this purpose (E. S. R., 14, p. 834), the author found that (1) the phosphoric acid precipitate contained as much silicic acid after separation of this substance as without such separation; (2) the error due to solubility of ammonium-magnesium phosphate in ammonium citrate was as great as that due to the simultaneous separation of silicic acid; (3) the lower results obtained by this method are apparently due to the increased solubility of the ammonium-magnesium phosphate precipitate, resulting from longer action of the ammonium citrate on this precipitate which takes place in the method.

On citrate-soluble phosphoric acid, P. M. Van Haarst (*Chem. Weekblad, 1 (1903), pp. 205–211, 221–226, 234–239; abs. in Chem. Centbl., 1904, I, No. 9, p. 694*).—The methods employed in studying Thomas slag are discussed and tests of a number of them are reported.

On the solubility of soil constituents, F. Mach (*Chem. Ztg., 27 (1903), No. 77, p. 941; abs. in Centbl. Agr. Chem., 33 (1904), No. 5, p. 348*).—Tests of the solubility in pure water, in water containing carbon dioxid, hydrated silicic acid, and suspended humic acid, and in dilute citric acid, of sandstone, shell limestone, basalt, feldspar, gray wacke, zeolites, and other substances are reported, 5 gm. of the pulverized material being treated for 6 to 8 weeks with 1 liter of the various solvents. In the case of the sandstone, graywacke, and basalt, and especially shell limestone, the water containing carbon dioxid dissolved considerably more than pure water.

The phosphate present was almost entirely dissolved in citric acid, but the water containing carbon dioxid dissolved less of this substance than pure water. An appreciable amount was dissolved in water containing hydrated silicic acid and humic acid. A larger proportion of calcium carbonate was dissolved in water containing carbon dioxid than in pure water. Water containing silicic acid dissolved twice as much of this substance as pure water; that containing humic acid 10 times as much, and that containing citric acid 53 times as much. Magnesium carbonate was dissolved in large proportion by all of the solvents. The author was led to make these tests as a result of observation that many plants are able to make a comparatively vigorous growth in a soil composed of freshly ground stone.

Water-soluble plant food of soils, H. Snyder (*Science, n. ser., 19 (1904), No. 491, pp. 834, 835*).—This is a study of the amounts of phosphoric acid removed from the soil by wheat at different stages of growth, the results showing that the wheat plant removes from the soil more phosphoric acid than is dissolved by extraction with water for 15 days. The paper was presented at the St. Louis meeting of the Society for the Promotion of Agricultural Science (E. S. R., 15, p. 543), and contains a critical analysis of the data given in Bulletin 22 of the Bureau of Soils of this Department.

A short method for the determination of potash in soils, potash salts, and similar compounds, J. Hasenbäumer (*Chem. Ztg., 28 (1904), No. 18, pp. 210, 211*).—In the method proposed the hydrochloric-acid solution of the soil is evaporated to dryness in a porcelain dish, taken up in water, and transferred to a platinum dish. Ammonia and ammonium carbonate are added and the solution evaporated to dryness. The residue is heated gently over a gas burner until the ammonium salts are driven off and the organic matter destroyed. The residue is treated for a short while with hot water, the solution filtered, and after acidification of the filtrate with hydrochloric acid, the potash is precipitated with perchloric acid or platinum chlorid.

Satisfactory tests of the method are reported. The object of evaporating to dryness and heating after the addition of ammonia and ammonium carbonate is to destroy the power of the bulky precipitate to occlude potash, as first pointed out by J. König.

On the determination of the available amounts of lime and magnesia in the soil, T. Katayama (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 2, pp. 103–124, pls. 2*).—A series of pot experiments with onions grown in sandy and loamy soils containing different proportions of lime and magnesia are reported. The available lime and magnesia in the soils were determined by extracting the fine earth (particles less than 0.25 mm. in diameter) for 50 minutes with boiling 10 per cent hydrochloric acid in the proportion of 50 cc. of acid to 25 gm. of soil. Check experiments with sand cultures were also made.

"Sand culture, as well as the cultures in two soils differing widely in character from each other, yielded the best results when the available amounts of lime and magnesia were present in the ratio 2:1; in other words, the onion has the lime factor 2. Lime and magnesia in the sand culture were added in form of solutions, hence the total amount of these salts were easily available, even if precipitated as finely divided phosphates. As to the soil culture the 'available amounts' of lime and magnesia were determined according to my modification of the usual method and their ratios changed by adding carbonate of lime in such quantities as to reach the fixed ratios of the sand culture. Since in all my experiments of 1902 and 1903 the ratio $\frac{CaO}{MgO}=\frac{2}{1}$ proved the most favorable for the onion plant, the determination of the available amounts must have been made by a reliable method."

The determination of sodium perchlorate in commercial sodium nitrate, H. Lemaître (*Monit. Sci., 4. ser., 18 (1904), p. 253; abs. in Chem. Ztg., 28 (1904), No. 31, Repert. No. 8, p. 108*).—With nitrate containing less than 4 per cent of perchlorate 5 gm. of the material is mixed with 3 gm. of pure dry sodium sulphite. The mixture is fused in a platinum dish, cooled, and taken up in water. The solution is heated to boiling and 200 cc. of a boiling 4 per cent barium nitrate solution is added. The precipitate is allowed to settle and the solution filtered. Eight and two-tenths cubic centimeters of approximately normal soda solution and 1.2 gm. of sodium persulphate are added and the solution boiled and filtered. The filtrate with the wash water is exactly neutralized with a weak acetic-acid solution, using phenophthalein as indicator, and titrated with tenth-normal silver nitrate, using potassium chromate as indicator to determine chlorin, or the chlorin may be determined gravimetrically. The treatment with sodium sulphite converts the chlorates and iodates into chlorids and iodids.

Comparison of methods for the quantitative determination of nitric acid in water, A. F. Dokatschajew (*Vrach [St. Petersburg], 1904, p. 26; abs. in Chem. Ztg., 28 (1904), No. 17, Repert. No. 4, p. 54*).—A comparison of the methods of Schultze-Tiemann, Noll, Grandval-Lajoux, Kostjamin, and Marx-Trommsdorff is reported. The most uniform and exact results were obtained by the first method.

Applicability of the Schloesing method of determining nitric nitrogen in the presence of organic matter, P. LIECHTI and E. RITTER (*Ztschr. Analyt. Chem., 43 (1904), No. 3, pp. 168–172*).—A series of experiments with mixtures of nitrates and ammonium salts and with urea, urine, and soil, is reported, which show the accuracy of this method if care is taken to insure the complete expulsion of air from the apparatus.

A comparison of simple methods of determining carbon dioxid in the air, A. F. LAUENSTEIN (*Jour. Ochran. Narodn. Sdrawija, 15 (1903), p. 422; abs. in Chem. Ztg., 28 (1904), No. 33, Repert. No. 9, p. 116*).—Comparisons of the Smith-Lunge, Lunge-Zeckendorff, Wolpert, Nagorski-Ssubbotin, and Pettenkofer methods are reported. The last two gave the most uniform and accurate results. This the author attributes to the more perfect absorption of the carbon dioxid of the air in these methods. For general sanitary analysis the Nagorski-Ssubbotin method is preferred on account of simplicity and reliability. A modification of Pettenkofer's method is described.

Contributions to technical chemical analysis, G. LUNGE (*Ztschr. Angew. Chem., 17 (1904), Nos. 7, pp. 195–203; 8, pp. 225–236; 9, pp. 265–270*).—Critical comments, based largely upon the results of original work, are made on chemical apparatus, various indicators, and numerous substances recommended for the preparation of standard solutions for use in volumetric analysis.

A possible source of error in fat determinations by the extraction methods, C. BARTHEL (*Nord. Mejeri Tidn., 18 (1903), No. 35, pp. 471, 472*).—The author finds that vigorous stirring of skim milk, as occurs in the pasteurization of the milk in some pasteurizing machines provided with stirrers, causes a subdivision of the fat globules; and that on drying the milk on paper, kaolin, sand, etc , the numerous minute globules thus formed can not be dissolved out by the ether, presumably because the surface attraction of the absorbing medium can not be overcome.

The Gottlieb method, on the other hand, gives correct results in the case of such milks, the percentages being from about one-tenth to four-tenths above those obtained by the Adams method, depending upon the fat content of the milk. The greater differences were observed in case of milk containing considerable quantities of fat. When samples of new milk were churned for 5 to 15 minutes at about 48° C. the results obtained with the separator skim milk by the extraction method were 0.18 to 0.44 per cent too low, while the results obtained by the two methods of analysis agreed within 0.01 to 0.04 of 1 per cent when the milk was not subjected to vigorous agitation.—F. W. WOLL.

On the quantitative separation of maltose and lactose, C. I. BOYDEN (*Vermont Sta. Rpt. 1903, pp. 198–201*).—This has been noted from another source (E. S. R., 14, p. 225).

Analysis of formaldehyde sold in North Dakota, E. F. LADD (*North Dakota Sta. Bul. 60, pp. 386–395*).—Analyses were made of a number of samples of commercial formalin. The content of formaldehyde was frequently below 40 per cent, and the packages were often short in weight or measure. The average formaldehyde content of a large number of these samples was about 33 per cent.

Miscellaneous analyses, C. H. JONES (*Vermont Sta. Rpt. 1903, pp. 201–203*).—Analyses are reported of 32 samples of fertilizing materials, home mixtures, and wood ashes, 3 samples of butter, 1 sample of maple sirup, and 1 of maple sugar.

Report of the division of chemistry, A. M. PETER (*Kentucky Sta. Rpt. 1900, pp. XI–XXXIV*).—During the year 1,211 samples, of which 599 were fertilizing materials, were analyzed. In this report analyses are given of 35 samples of butter, 67 of sorghum-cane juice, 72 of sugar beets, 2 of silicate of potash, 4 of feeding stuffs, 7 of soils, 2 of tobacco extract, 5 of tobacco stems and stalks, 3 of potassium nitrate, 1 of

crude petroleum, 1 of phosphatic limestone, 26 of mineral waters, and the stomach contents of several animals suspected of having been poisoned.

Report of the chemical control station, Trondhjem, Norway, 1902, E. SOLBERG (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1902, pp. 249–300*).—Several lines of work are reported upon briefly.

Maximum and minimum data for 151 samples of butter from 6 Norwegian creameries are as follows: Specific gravity 0.8632 (June) and 0.8672 (January); index of refraction 39.1 (December) and 43.1 (June); Reichert-Meissl number 21.6 (June) and 33.9 (December). The water content of 63 samples was as follows: Minimum 10.33, maximum 17.25, and average 12.71 per cent. The addition of potassium bichromate to milk samples did not affect the determination of fat by the Adams or Lindström methods for a period of at least 2 months.

Comparative tests of different methods of determining fat in feeding stuffs are reported and analyses of barley, rye, potatoes, and other crops are given.

A number of fertilizer experiments with pastures, cereals, and potatoes are reported. In the experiments with potatoes the effects of fertilization with sea weeds were studied, mixtures of *Fucus nodosus* and *F. vesiculosus*, *Laminaria digitata*, etc., and eelgrass (*Zostera marina*) were applied either alone, at the rate of 7,200 kilos per 10 are ($\frac{1}{4}$ acre), or in connection with nitrate of soda and superphosphate. The results did not agree with those obtained in similar trials during the preceding season, and therefore do not permit of generalization.

The report of the control work of the station contains summary statements and discussions of analyses of the usual agricultural products.—F. W. WOLL.

Report of the chemical control station and the seed control station, Christiania, Norway, 1902, S. HALS (*Aarsber. Offent. Foranstalt. Landbr. Fremme, 1902, pp. 198–248*).—The report contains the usual summary of results obtained in the examination of feeding stuffs, fertilizers, soils and soil amendments, food materials, etc. Brief accounts of analyses made in special investigations of barley, root crops, potatoes, and peat fuel are also given in the report.

The report of the seed control station during the year contains statements of analyses of 1,287 seed samples and also an account of the system of agreement with seedsmen, arranged for by the station, by which free-seed examinations may be had by all buyers of goods, the price of which exceeds 25 kroner ($6.70), with a copy of the contract made between the station and the dealers, and the rules governing the examinations of seeds.—F. W. WOLL.

Concerning the nomenclature of enzyms, E. O. VON LIPPMANN (*Ber. Deut. Chem. Gesell., 36 (1903), No. 2, pp. 331, 332*).—In view of the confusion which exists in the names of enzyms, the author proposes a system of compound names in which the first part shows the substance acted upon and the second part the principal product produced; for instance, the name of the enzym producing maltose from starch would be amylo-maltase.

Physical chemistry for physicians and biologists, E. COHEN, trans. by M. H. FISCHER (*New York: Henry Holt & Co., 1903, pp. VIII + 343, figs. 49*).—This is an authorized translation.

ZOOLOGY.

Report of the New York Zoological Society for 1903 (*Eighth Ann. Rpt. New York Zool. Soc., 1903, pp. 216, pls. 27, figs. 20*).—As in previous reports of this society, lists are given of the officers, managers, members, etc., of the society, together with a detailed report by the director, W. T. Hornaday, and special articles on the care and diseases of various animals in confinement.

Experiments were carried on for the purpose of determining whether oysters could be readily infected with typhoid bacilli. C. W. Field, who did this work, found that while typhoid bacilli were destroyed to a considerable extent by the action of fresh

sea water, oysters could, nevertheless, be infected when exposed to conditions similar to those of ordinary fattening. It is suggested, therefore, that the sale of fattened oysters should be prohibited and greater care be exercised in preventing the contamination of oysters with sewage.

W. R. Blair presents a report on the diseases of animals in the zoological park for the year. During the year deaths occurred from pneumonia, gastro-enteritis, various digestive disturbances, and intestinal parasites. The subject of cage paralysis was studied by H. Brooks. It was found from a careful examination of a number of cases of this disease that the affection differs in different cases and is due to different causes, as in similar affections in man. Most cases of cage paralysis are forms of spinal paralysis of which the etiology is not well known.

The internal parasites of wild animals received considerable study by W. R. Blair. Notes are given on the morphology, life history, and means of eradicating a number of such parasites. The volume also contains articles on lizards, birds, manatee, raccoon dog, and on the origin and relationship of the large mammals of North America.

Second report on economic zoology, F. V. THEOBALD (*London: British Mus. (Nat. Hist.), 1904, pp. X + 197, figs. 29*).—As in the previous report of the author, the insects and other animals discussed in this volume are classified according to the manner in which they affect man, animals, cultivated plants, and household materials. Notes are given on the mosquito nuisance in various parts of Great Britain with especial reference to the best means for combating these pests. Notes are also given on *Stomoxys calcitrans* and other insects affecting domestic animals.

The author discusses sheep scab, ticks on poultry, lice on geese and pigs. Numerous miscellaneous notes are also given on the insects injurious to cereals, legumes, fruits, forest trees, garden vegetables, stored grain, food materials, tapestry, etc. Mention is made of the value of pigs and poultry in destroying insects in orchards. Quite elaborate accounts are presented of cabbage-root maggot, spruce aphis, goat moth, and the insects injurious to wine corks.

Zoological record, D. SHARP (*Zool. Rec., 39 (1902), pp. XLII + 1190*).—As usual in this publication detailed lists of literature have been brought together, pertaining to the various groups of the animal kingdom, and published chiefly during the year 1902.

Index-catalogue of medical and veterinary zoology, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 39, pt. 6, pp. 437–510*).—A continuation of the author catalogue relating to medical and veterinary zoology, including names beginning with F.

Catalogue of living and fossil mammals, E. L. TROUESSART (*Catalogus Mammalium tam Viventium quam Fossilium. Quinquennale Supplementum. Berlin: R. Friedländer & Son, 1904, No. 1, pp. 288*).—This constitutes a supplement to the author's catalogue of mammals, published in 1897, and contains additional names, together with changes which have occurred since that date in the groups—Primates, Prosimiæ, Chiroptera, Insectivora, Carnivora, and Pinnipedia.

The rabbit pest in New South Wales, C. FETHERSTONHAUGH (*Jour. Dept. Agr. West Australia, 8 (1903), No. 6, pp. 555–557*).—The author briefly recounts the history of the rabbit pest in New South Wales with notes on the means which have been adopted for exterminating these animals. It is reported that satisfactory results have been obtained from the liberal use of poisoned water and poison baits.

The resistance of rats to arsenical poisoning, F. BORDAS (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 13, p. 836*).—According to the author's experiments, rats may withstand unusually large single doses of arsenic, but are especially susceptible to repeated daily small doses. In some instances rats were destroyed by small doses of arsenic before the total quantity had reached an amount equal to single doses, which were withstood without injurious effects.

Destruction of rats and mice, J. K. GOWDY (*U. S. Dept. Com. and Lab., Mo. Consular Rpts., 75 (1904), No. 284, pp. 417–419*).—A brief outline is presented of the work carried on by Roux and Chamberland in distributing cultures of pathogenic bacteria for the destruction of rats and mice. Fields in which this material was distributed were subsequently plowed up and examined with the result that the methods seemed to have proved very effective. Apparently 95 per cent of the field mice were destroyed.

Combating field mice, G. GUÉNAUX (*Bul. Agr. Algérie et Tunisie, 10 (1904), No. 4, pp. 82–84*).—A report is made concerning the results obtained in combating field mice by the use of pathogenic bacterial cultures as recommended by the Pasteur Institute of Paris. The results thus far obtained indicate that the method is exceedingly effective in destroying field mice and apparently no danger is to be feared from the infection of other animals.

A new field mouse in Japan, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 51–55, pl. 1*).—The author describes as a new species under the name *Arvicola hatanedzumi*, a field mouse which he discovered and studied with reference to its habits and economic status. The nests are carefully described and notes are given on the methods by which the mouse may be captured. Good results are reported from the use of mouse typhus bacillus in destroying this pest.

The distribution of cultures of mouse typhus, K. KORNAUTH (*Ztschr. Landw. Versuchsw. Oesterr., 7 (1904), No. 3, pp. 158, 159*).—The author states that a considerably increased demand has been made for cultures of mouse typhus bacilli to be distributed in infested fields. This increased demand is apparently due to the uniformly effective results obtained by the use of the cultures.

A review of parthenogenesis, E. F. PHILLIPS (*Proc. Amer. Phil. Soc., 42 (1903), No. 174, pp. 275–345*).—A critical review is given of the literature of this subject in connection with an extensive bibliographical list. The author discusses in a historical manner the various theories which have been proposed regarding the origin of the different kinds of individuals in the colonies of bees. The evidence thus far obtained by various experimenters indicates that the theory of Dzierzon is a most plausible one. Notes are also given on other cases of parthenogenesis observed in insects, crustacea, trematodes, rotifers, spiders, and vertebrates. A brief account is also given of the causes of parthenogenesis in connection with a discussion of the determination of sex, pædogenesis and partial parthenogenesis.

A guide to the birds of New England and eastern New York, R. HOFFMANN (*Boston: Houghton, Mifflin & Co., 1904, pp. XIII+357, pls. 4, figs. 95*).—The purpose of this book is to awake an interest in the study of bird life by a description of methods of observing birds in the field with notes on their migration, nest building, and other habits. Keys are given to assist in the identification of species of birds common for various months of the year.

With the birds in Maine, OLIVE T. MILLER (*Boston: Houghton, Mifflin & Co., 1904, pp. IX+300*).—This volume contains miscellaneous notes on the habits and economic relations of a number of species of birds which occur in Maine and other eastern and middle States.

Birds of California, IRENE G. WHEELOCK (*Chicago: A. C. McClurg & Co., 1904, pp. XXVIII+578, pls. 10, figs. 77*).—In this volume the author presents a popular discussion of over 300 species of birds recognized as of common occurrence in California and adjacent islands. In connection with each species notes are given on the feeding and nesting habits of the birds. The analytical key which serves to assist in the identification of the species is based on the color and certain other characteristics of the species concerned. The identification of different species of birds is thus rendered comparatively simple. A supplementary list is also given of rare migrant birds and subspecies occasionally observed in the State.

The birds of Ohio, W. L. Dawson (*Columbus: The Wheaton Pub. Co., 1903, pp. XLVII+671, pls. 81, figs. 215*).—In this volume the author presents an elaborate account of the habits and economic relations of the 320 species of birds known to occur in Ohio. Of this number 80 species are well illustrated on colored plates and the nests and eggs of various other species are shown in half-tone illustrations. An analytical key is given for the purpose of assisting in the identification of the species of birds and in an appendix a list is presented of birds which are supposed to have occurred in Ohio, and also a migration table showing the average dates of arrival and departure for different species.

Birds observed by Wellington Field Naturalists' Club, 1903 (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 34–36*).—Statistical data are presented regarding the prevalence of a number of species of birds.

Fieldbook of wild birds and their music, F. S. Mathews (*New York: G. P. Putnam's Sons, 1904, pp. XXXV+262, pls. 53*).—The author describes in a popular manner the habits of species of birds most common in eastern United States, with special reference to their songs as a means of identifying the species.

Birds in relation to agriculture, Gunning (*Transvaal Agr. Jour., 2 (1904), No. 6, pp. 148–151, pls. 5*).—The feeding habits and economic importance of various species of eagles, kites, and owls are discussed.

What birds do for the farmer, Josephine C. Horney (*Ohio State Bd. Agr. Rpt. 1902, pp. 501–506*).—Attention is called to the economic importance of various species of birds in the destruction of injurious insects and weed seeds.

Bird problems as related to horticulture, J. S. Cook (*Trans. Illinois Hort. Soc., n. ser., 37 (1903), pp. 327–335*).—The relationship of birds to the production of fruits is briefly discussed. Notes are given on the feeding habits of certain birds and on the necessity of bird protection.

Birds, fruits, and insects, J. B. Smith (*Proc. New Jersey State Hort. Soc., 29 (1904), pp. 88–93*).—The economic relation of birds to fruit raising is briefly discussed. It is argued that no important fruit insect is controlled or even appreciably reduced in numbers by the agency of birds. The author believes, therefore, that the destruction of fruit by birds, particularly robins, brings about a loss to the fruit grower which is quite out of proportion to the advantage gained by the presence of the birds. It is recommended, therefore, that in framing bird-protection laws the proviso should be inserted that these laws should not be construed to prevent farmers and fruit growers from killing birds which actually injure or destroy fruit, berries, or other farm crops.

The economic value of our native birds, H. A. Surface (*Pennsylvania State Dept. Agr., Zool. Quart. Bul. 1 (1904), No. 4, pp. 32, pls. 4*).—The author discusses in a popular manner the feeding habits and economic relations of the various species of owls found in Pennsylvania.

The economic relations of crows, Schleh (*Arb. Deut. Landw. Gesell., 1904, No. 91, pp. 167*).—The author's observations were made on *Corvus corona*, *C. frugilegus*, and *C. cornix*. The detailed results of the examination of stomach contents of these birds are presented in a tabular form.

In all, 474 stomachs were examined, of which 93.7 per cent contained animal food and 92.2 contained plant food. The plant food consisted of various grains, legumes, garden crops, fruits, weeds, etc., while the animal food consisted of portions of mammals, birds, fish, and other vertebrates, together with insects, snails, etc. The species of insects eaten by crows are presented in a tabular form. The author concludes as a result of his study of these birds that while much damage is done by them under certain conditions, the beneficial actions of the species in question more than counterbalance their attacks upon cultivated crops.

Experiments in the acclimatization of Leiothrix lutea, H. von Berlepsch (*Abhandl. u. 48 Ber. Ver. Naturk. Kassel, 1902–3, pp. 270–284, figs. 3*).—A number of

these birds were introduced and reared in confinement with considerable success. They were then set at liberty and succeeded in establishing themselves as shown by nests which were observed by the author. Later, however, they were apparently exterminated by hunters. Further attempts at introducing them will be made.

Thirteenth annual report of the society for the protection of birds (*London, 1903, pp. 52*).—This report contains a brief account of the work of the society during the year 1903 in studying the feeding habits of birds and in encouraging the protection of birds and birds' nests.

The avicultural magazine, D. SETH-SMITH (*London: R. H. Porter, 1903, n. ser., vol. 1, pp. XX+431, pls. 32, figs. 17*).—This volume contains numerous short articles on the birds of England and other countries in freedom and captivity. The avicultural magazine is the journal of the avicultural society whose purpose is to study the habits and relations of birds. Many articles are of an economic nature and contain data on the relationship of birds to man both in rural and city districts. Notes are also given on the influence of diet on the death rate among birds.

METEOROLOGY—CLIMATOLOGY.

Meteorological summary for 1900 (*Kentucky Sta. Rpt. 1900, pp. XXXVII–XLII*).—Summaries of observations on pressure, temperature, precipitation, cloudiness, wind, thunderstorms, snow, hail, etc., are given for each month of 1900.

Meteorological observations, D. V. C. MANSO DE ZUÑIGA (*Mem. An. Estac. Enol. Haro, 1903, July, p. 47*).—A summary is given of observations at this station during the year ended June 30, 1903, on atmospheric pressure, temperature, precipitation, humidity, evaporation, sunshine, cloudiness, and wind movement.

Relations of climate to horticulture, J. W. SMITH (*Jour. Columbus Hort. Soc., 18 (1903), No. 4, pp. 143–151*).—The meteorological and phenological records kept by T. Mikesell, at Wauseon, Fulton Co., Ohio, since January, 1870, are reported and briefly discussed.

Climatic limits, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt., 1903, pp. 5–9*).—Reports from different parts of Ontario regarding the northerly limits of successful culture of various crops, especially peaches, grapes, pears, cherries, apples, tomatoes, and corn, are summarized and discussed.

The economic geography of Chile, J. R. SMITH (*Bul. Amer. Geogr. Soc., 36 (1904), pp. 1–21; abs. in Science, n. ser., 19 (1904), No. 490, p. 802*).—This paper contains notes on the climate of Chile in which emphasis is laid on the striking contrast between the northern desert regions and the southern cool and rainy districts lying within the latitudes of the prevailing westerly winds.

Atmospheric tides (*Abs. in Nature [London], 69 (1904), No. 1799, p. 597*).—This is a brief note on an article on this subject by W. Krebs in *Das Weltall* of December, 1903, in which an attempt is made to explain, as a result of gravitation, the atmospheric oscillation in the course of a lunar day first discovered by Mädler.

A new sunshine recorder (*Science, n. ser., 19 (1904), No. 490, pp. 801, 802*).—This is a brief description of a sunshine recorder, a more detailed account of which is given in *Symons' Meteorological Magazine* for March, 1904.

Lightning report, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 4, 5*).—A record is given of barns and trees struck and live stock killed in Ontario during 1903, with estimated value of losses. An analysis of the species of trees and animals and the kinds of buildings struck during 1901–1903 is also given. The records show the frequency of the destruction of unprotected barns, and that "such trees as spruce, elm, or maple, planted near the farmstead, are a permanent and an increasing means of protection from lightning."

WATER—SOILS.

Water softening, J. O. HANDY (*Engineer. News, 51 (1904), No. 21, pp. 500–508, figs. 7*).—This article deals quite fully with the processes and appliances for softening water for boiler, domestic, and manufacturing purposes, especial attention being given to the feasibility of softening the entire supplies of municipalities as is now done at Winnipeg, Manitoba, and other places.

Studies of color in water; Metropolitan water supply, Massachusetts, E. G. HOPSON (*Engineer. News, 51 (1904), No. 17, pp. 414–416, figs. 3*).—A study of the water from the drainage area of the Ashland reservoir of the Metropolitan Waterworks is reported, from which the conclusion is drawn that "a brook whose color is increased temporarily to a high point during and after rains, but which in general flows of a light color, shows indications of pollution from the flushing of stagnant surface pools in swampy lands, and a remedy for the temporary high color may probably be found by the construction of shallow channels to prevent the accumulation of such surface water.

"A brook that steadily maintains a high degree of color for long periods gives sure proof of the accession of leachings from peat beds, and the remedy may only be found by a system of deep drainage. . . .

"A brook whose color is generally very low excepting during or immediately after rains shows an almost entire freedom from swamp pollution, with the exception of surface washings, which are unavoidable."

Elements of water bacteriology, S. C. PRESCOTT and C. E. A. WINSLOW (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1904, pp. X+162, fig. 1*).—It is stated to be the purpose of this book to present the results of American investigation on the bacteriology of water in such form as to "give a correct idea of the best American practice," and to do this "with such completeness as shall render the volume of value to the expert and at the same time with such freedom from undue technicality as to make it readable for the layman."

The topics discussed in the different chapters are: The bacteria in natural waters, the quantitative bacteriological examination of water, the interpretation of the quantitative bacteriological analysis, determination of the number of organisms developing at the body temperature, the isolation of specific pathogenes from water, methods for the isolation of the colon bacillus, significance of the presence of *Bacillus coli* in water, presumptive test for *B. coli*, other intestinal bacteria, and the significance and applicability of the bacteriological examination. A list of 180 references to sources of information used in the book is given.

The bacteriological examination of water, J. C. THRESH and G. SOWDEN (*Public Health [London], 16 (1904), No. 8, pp. 459–492*).—The accuracy and value of various methods of bacteriological examination of water are discussed and results of a large number of such examinations, especially with reference to the occurrence of *Bacillus coli communis*, are reported.

The significance of bacteriological methods in sanitary water analysis, C. E. A. WINSLOW and C. P. NIBECKER (*Public Health [London], 16 (1904), No. 8, pp. 493–501*).—The subjects discussed in this paper are sanitary inspection and its limitations, the quantitative bacteriological examination of water, the isolation of intestinal bacteria, the fermentation and litmus-lactose-agar plate tests. The results of examinations by means of gelatin and litmus-lactose-agar plates and dextrose broth tubes of over 250 samples of water from apparently unpolluted sources are reported and discussed. A list of 14 references to articles relating to the subject is given.

The Michigan method for the bacteriological examination of water, V. C. VAUGHAN (*Public Health [London], 16 (1904), No. 8, pp. 502, 503*).—The method is briefly described.

The bacteriological analysis of soils, F. D. CHESTER (*Delaware Sta. Bul. 65, pp. 51–76, figs. 5*).—This is a discussion, based upon station investigations, of the

relations of bacteriological processes to soil fertility, and the conditions affecting the development of soil bacteria, with descriptions of the method of making a bacteriological analysis of soils and the results of a number of such analyses of Delaware soils.

The results reported include data relating not only to the number of bacteria in different types of soil at different depths, but also their ammonifying and acidifying efficiency, the first representing "the number of parts of ammonia produced in 10 days in a standard peptone broth medium culture, kept at 20° C., compared with the amount present in the blank inoculated medium, kept under the same conditions, and taken as unity;" the second representing "the amount of normal acid produced in a 10-day 2 per cent cane sugar broth culture compared with that present in the blank taken as unity." The principal results are summarized in the following table:

The relation of the number of bacteria in the soil to ammonifying and acidifying efficiency.

Soil.	Total number of bacteria per gram of dry soil.	Total ammonifying efficiency.	Total acidifying efficiency.
Experiment station garden:			
First analysis	3,130,000	13.75	2.22
Second analysis	1,294,000	2.48	1.81
Murray soil, Viola	250,000	2.13	.69
Killen soil, Felton	540,000	8.90	.58
Detrich soil, Chestnut Hill	4,040,000	26.68	8.57

"The above table shows that while zymotic efficiency is generally proportionate to the total number of bacteria present in a soil, it is not exactly proportionate; that is, zymotic efficiency may increase at a much greater rate than the numbers. In other words, it is not only numbers of bacteria but also kinds which determine the efficiency of a soil; or, again, a high bacterial potential is quite as important as high numbers.

"The kinds of bacteria in a soil seem to be an extremely fortuitous matter. There is a possibility that the future will develop some practical means of introducing favorable bacterial forms into the soil and thus of raising bacterial potential.

"It will then become merely a question of increasing numbers to attain the highest possible efficiencies.

"Numbers can be increased by the introduction of sufficient humus into the soil to form food for the bacteria and by stimulating their growth by active tillage.

"Deep plowing means that a thicker zone of soil will be brought under bacterial action. More frequent cultivation means better comminution, better aeration, and a better conservation of moisture. These are all necessary conditions for bacterial development."

Soil moisture investigations for the season of 1903, J. D. TINSLEY and J. J. VERNON (*New Mexico Sta. Bul. 48, pp. 15*).—This is an account of a continuation with wheat in place of corn of investigations which have been carried on at the station for a number of years (E. S. R., 15, p. 343). The principal objects in view in the experiments here reported were to study "(1) the effects of different numbers of irrigations on the yield of wheat, especially the effect of frequent irrigations from the time of heading until the crop began to ripen; (2) the relation between the number of irrigations, the amount of moisture in the soil, and the yield; (3) the distribution of the soil moisture in depth, percolation; (4) the relation between the amount of water applied and the soil moisture."

The plan of experiment and the general methods of procedure were the same as in previous investigations. The results obtained are summarized as follows:

"(1) Too much water causes growing wheat to turn yellow, retards ripening a few days, and causes a decreased yield of grain.

"(2) This (adobe) soil when kept three-fourths saturated throughout the season is too wet for wheat.

"(3) Wheat will do well up to the time of filling in a soil that would be comparatively dry for corn, and if the soil is kept quite moist at the time of filling the yield will be about as good as if this high moisture content had been maintained throughout the season.

"(4) Adjacent plats kept in nearly identical moisture condition show considerable differences in yield, and also plats which vary very much in moisture content may give nearly the same yield. This shows that other factors exert a marked influence on yield.

"(5) The most of the water applied to these plats was held in the first 3 ft. of the soil.

"(6) When this soil is fairly dry it will absorb about 5 acre-inches of water."

Soil temperatures at various depths, J. B. Reynolds (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, p. 12, fig. 1*).—A record is given of monthly soil temperatures at depths of 3 and 6 in. and 1, 2, and 3 ft. from April to December, 1903, inclusive. The daily variations are also summarized.

Investigation of the composition of soils rich in vegetable matter, E. G. De Coriolis (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 38–40, fig. 1*).—Pot experiments with such a soil shown by analysis to be deficient in available potash are reported. The results indicate that the greatest need of the soil was an improvement of the conditions necessary to the growth of nitrifying organisms.

Analyses of soils of the State, G. d'Utra (*Bol. Agr. São Paulo, 4. ser., 1903, No. 12, pp. 551–557*).—Chemical analyses of 91 samples of soils from different parts of São Paulo are reported, with suggestions as to their fertilizer requirements.

Analyses of soils, C. F. Juritz (*Rpt. Senior Analyst, Cape Good Hope, 1903, pp. 45–48*).—Chemical analyses of 24 samples of soil from different parts of the Colony are reported and discussed.

Analyses of soils from Armant, F. Hughes (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 1, pp. 13–16*).—Total and available (by Dyer's method) potash and phosphoric acid and nitrogen are reported. Only a very small proportion of the total potash and phosphoric acid were available.

Preliminary analytical studies of the cultivated soils of Padua, G. Ongaro (*Staz. Sper. Agr. Ital., 36 (1903), pp. 926–930; abs. in Chem. Centbl., 1904, I, No. 15, pp. 1098, 1099*).—Data for mechanical and chemical analyses of some of these soils are reported.

Experiments in washing salt land (*Jour. Khediv. Agr. Soc. and School Agr., 6 (1904), No. 1, p. 12*).—In a comparative test of warping, washing by means of open drains, and washing by means of tile drains, the best results in yield of cotton were obtained by the last method.

The work of the Bureau of Soils (*U. S. Dept. Agr., Bureau of Soils Circ. 13, pp. 13*).—A condensed account of the work of the Bureau with particular reference to its practical side, intended for distribution at the Louisiana Purchase Exposition.

Geology, T. C. Chamberlin and R. D. Salisbury (*New York: Henry Holt & Co., 1904, vol. 1, pp. XIX+654, pls. 24, figs. 471*).—"In the preparation of this work it has been the purpose of the authors to present an outline of the salient features of geology, as now developed, encumbered as little as possible by technicalities and details whose bearings on the general theme are unimportant. In common with most writers of text-books on geology, the authors believe that the subject is best approached by a study of the forces and processes now in operation, and of the results which these forces and processes are now bringing about. Such study necessarily involves a consideration of the principles which govern the activities of geologic agencies. These topics are presented in Volume I, and prepare the way for the study of the history of past ages, which is outlined in Volume II.

"The general plan of the work has been determined by the experience of the authors as instructors. Little emphasis is laid on the commonly recognized subdivisions of the science, such as dynamic geology, stratigraphic geology, physiographic geology, etc. The treatment proceeds rather from the point of view that the science is a unit, that its one theme is the history of the earth, and that the discussions of dynamic geology, physiographic geology, etc., apart from their historical bearing, lose much of their significance and interest. The effort has, therefore, been to emphasize the historical element, even in the discussion of special themes, such as the work of rivers, the work of snow and ice, and the origin and descent of rocks. This does not mean that phases of geology other than historical have been neglected, but it means that an effort has been made to give a historical cast to all phases of the subject, so far as the topics permit."

After a preliminary outline dealing with astronomic geology and geognosy, the topics treated in separate chapters of this first volume are the atmosphere as a geological agent, the work of running water, the work of ground (underground) water, the work of snow and ice, the work of the ocean, the origin and descent of rocks, structural (geotectonic) geology, the movements and deformations of the earth's body (diastrophism), the extrusive processes, and the geologic functions of life.

FERTILIZERS.

Essentials of plant life, T. Jamieson (*Agr. Research Assoc.* [*Scotland*] *Rpt. 1903, pp. 22–27*).—The results of experiments during 18 years on the fertilizer requirements of the leading botanical families of plants are briefly summarized. The results tend to confirm the generally accepted opinion that nitrogen, phosphorus, and potassium are essential to plant growth. They also indicate that sulphur is not essential, and "that the influence of calcium and magnesium on the actual growth of the plant is so slight, if any, that it may be disregarded in practice, especially as both soil and the ordinary manures always contain a certain proportion of these elements."

Effect of manure on exhausted soil, T. Jamieson (*Agr. Research Assoc.* [*Scotland*] *Rpt. 1903, pp. 13–21, figs. 4*).—In experiments with turnips grown on small plats higher yields were obtained with manure than with any of the mixtures of artificial fertilizers used. The use of heavy applications of artificial fertilizers apparently hastened maturity and reduced the final yield.

Gypsum as a means of preventing loss of ammonia in the decomposition of manure, S. A. Severin (*Centbl. Bakt. u. Par., 2. Abt., 11* (*1904*), *Nos. 12–13, pp. 389–396; 14–15, pp. 442–451; abs. in Chem. Ztg., 28* (*1904*), *No. 17, Repert. No. 4, p. 56*).—In experiments in which the manure was first sterilized and then inoculated with pure cultures of manure bacteria it was observed that gypsum combined with the ammonia produced and reduced the loss of nitrogen one-half, at the same time promoting slightly the oxidation of the organic matter.

The agricultural value of city sewage in India, J. W. Leather and J. Mollison (*Agr. Ledger, 1903, No. 2* (*Agr. Ser., No. 36*), *pp. 37–54*).—Modern methods of sewage purification are briefly described and experiments begun at Poonah and Manjri in 1898 to test methods of purification and to determine the value of sewage and sewage effluent as a fertilizer are reported. These experiments show in general that purified sewage has a considerable fertilizing value for sugar cane and other crops.

On the influence of different ratios of lime to magnesia on the growth of rice, K. Aso (*Bul. Col. Agr., Tokyo Imp. Univ., 6* (*1904*), *No. 2, pp. 97–102, pl. 1*).—The results of a series of pot experiments are reported which show that "(1) the lime factor for rice agrees nearly with that of other Gramineæ which is between 1

and 2; (2) the rice plant seems to possess a relatively considerable resistance power against an excess of magnesium carbonate, since this does not depress the yield so much as the same excess of lime; (3) rice culture demands special attention to the proper ratio of lime to magnesia, since the maximal yield depends to a great degree upon the ratio 1:1."

The effect of liming in connection with the application of mineral fertilizers, P. VAN BIERVLIET (*Rev. Gén. Agron.* [*Louvain*], *13* (*1904*), *No. 2, pp. 81–83*).—A brief general statement.

Stone lime v. ground lime as a fertilizer, M. SAUL (*Deut. Landw. Presse, 31* (*1904*), *No. 36, pp. 321, 322*).—A brief discussion of the relative merits of these two kinds of lime under different conditions.

The preparation of soluble phosphoric acid from crude phosphates for fertilizing purposes, A. YSTGAARD (*Teknisk Ugeblad, Christiania, 50* (*1903*), *p. 329; abs. in Chem. Ztg., 28* (*1904*), *No. 17, Repert. No. 4, p. 56*).—A method of rendering phosphates soluble by fusion with carnallit is described, and the fertilizing value of the product thus obtained is discussed. Pot experiments comparing the product with Thomas slag on oats and peas are reported. The results showed that the prepared phosphate was more effective, especially as regards seed production, than the slag. The author attributes this result to the fact that the phosphoric acid in the prepared phosphate is in the form of a magnesium salt and the use of the phosphate resulted in a more favorable relation between lime and magnesia.

Rock phosphates and other mineral fertilizers: Their origin, value, and sources of supply, C. CHEWINGS (*Adelaide, South Australia: C. E. Bristow, 1903, pp. 48, map 1*).—This pamphlet discusses sources of nitrogen and potash in fertilizers and tests for these substances as well as tests for phosphoric acid and the origin, sources, mining, and preparation and use in fertilizers of the various phosphates.

The century in phosphates and fertilizers, P. E. CHAZAL (*News and Courier* [*Charleston*], *1903, Centennial ed., pp. 62–65, figs. 4; 1904, Apr. 20, pp. 12, 13*).—An historical review.

From mine to field, E. WILLIS (*News and Courier* [*Charleston*], *1904, Apr. 20, pp. 10, 11*).—This is a review of the trade in rock phosphate and fertilizers for the year ended September 1, 1903.

Mines and quarries (*U. S. Dept. Com. and Labor, Bureau of the Census Bul. 9, pp. 59*).—This is a preliminary report for the year ended December 31, 1902. The data of special agricultural interest contained in this bulletin are statistics relating to the production and value of phosphate, gypsum, and marl. The product of the phosphate mines of the United States during 1902 is reported as 1,548,720 long tons worth $4,922,943. The production of gypsum during the same year was 816,478 short tons, worth $2,089,341; of marl, 12,439 short tons, worth $12,741.

The mining and preparation of nitrate of soda, V. SCHOULTZ (*Deut. Landw. Presse, 31* (*1904*), *No. 39, pp. 341, 342, figs. 6*).—A brief description of the methods employed in Chile.

Potash fertilizers: Sources and methods of application, H. J. PATTERSON (*Pennsylvania State Dept. Agr. Bul. 117, pp. 45*).—Substantially a reprint of Maryland Station Bulletin 89 (E. S. R., 15, p. 461).

Analyses of commercial fertilizers and Paris green, W. C. STUBBS and C. H. O'ROURKE (*Louisiana Stas. Bul. 76, 2. ser., pp. 266–359*).—This bulletin is a detailed report on the fertilizer and Paris green inspection in Louisiana during the season 1902–3. It includes also the text of the State fertilizer law as amended at the last session of the legislature.

Fertilizer inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 101, pp. 21–36*).—"This bulletin contains the analyses of manufacturers' samples of brands of fertilizers licensed before March 1, 1904."

Commercial fertilizers, W. W. MILLER and N. W. LORD (*Offic. Rpt. Sec. Ohio State Bd. Agr. on Com. Ferts., 1903, pp. 90*).—This is a report of analyses of 567 samples of fertilizers examined by the State chemist during the year 1903, with a list of certificates filed by manufacturers, etc., under the State law. The analyses are accompanied by explanatory notes and the text of the State fertilizer law.

Analyses of commercial fertilizers, W. FREAR (*Pennsylvania State Dept. Agr. Bul. 119, pp. 115*).—This bulletin gives the results of analyses and valuations of samples of fertilizers collected by the State Department of Agriculture from August 1 to December 31, 1903, with a statement of guaranties filed by manufacturers.

Commercial fertilizers, J. L. HILLS, C. H. JONES, and F. M. HOLLISTER (*Vermont Sta. Bul. 107, pp. 275–296*).—This bulletin gives an abstract of the State fertilizer law as amended in 1902, a schedule of trade values used in Vermont with a discussion of the valuation of fertilizers, a list of registered fertilizer firms and brands, analyses and valuations of fertilizers examined during the season, and the average composition of the principal fertilizers examined by the station during 5 years, 1899–1903.

Commercial fertilizers, J. H. STEWART and B. H. HITE (*West Virginia Sta. Bul. 91, pp. 56*).—This is an account of fertilizer inspection under State law during the first half of 1903.

FIELD CROPS.

Alfalfa in Wisconsin, R. A. MOORE (*Wisconsin Sta. Bul. 112, pp. 10, figs. 4*).—This bulletin gives directions for the culture of alfalfa, pointing out especially the manner of harvesting the crop, and presents conclusions based on the experience in growing alfalfa at the station and the data obtained from former students throughout the State.

These data favor the use of at least 20 lbs. of good seed per acre, early spring sowing, fall plowing, and growing with barley or oats as a nurse crop sowing 1 bu. per acre. It was observed that the varieties of alfalfa grown at the station showed very little difference in appearance or yielding capacity, and that in the alfalfa fields of 17 counties of the State the plants developed the root tubercles without special soil inoculation. The crop was found to cure with no greater difficulty than heavy cuttings of clover. A method of testing alfalfa seed is described.

Cañaigre, R. F. HARE (*New Mexico Sta. Bul. 49, pp. 15*).—This bulletin describes in a popular manner the culture and uses of cañaigre, points out the importance of the crop for New Mexico, and reviews experimental work with this plant at the Arizona, California, and Texas Experiment Stations. Results at the station have shown that cultivated plants with sufficient soil moisture will produce seeds which germinate readily. As fertile seed can not be purchased the plant is propagated from the roots exclusively. It was further found that the crowns of the roots should be covered with about 6 in. of soil to protect them against frost. Reference is made to a previous bulletin on the subject by the station (E. S. R., 6, p. 984).

Report of the experimentalist, C. A. ZAVITZ (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 113–151, figs. 4*).—The experiments in agronomy for 1903 are reviewed and statistics on the production of farm crops in Ontario for the season are reported. The work of former years has been previously noted (E. S. R., 15, p. 26).

Average results of 4 experiments in growing different farm crops under similar conditions show that Joanette oats led in the weight of grain produced per acre, the yield being 2,693 lbs.; Mandscheuri barley, with 2,611 lbs. per acre, ranking second, and Emmer, with 2,556 lbs., third. Of the crops under trial Alaska oats ripened first and Spring Vetch last. White Hulless barley and Alaska oats produced the weakest and Wild Goose spring wheat the stiffest straw. In cooperative experiments through-

out Ontario with a number of the same crops, Emmer led in yield with 1,968 lbs. per acre, being followed by Mandscheuri barley and Siberian oats, yielding 1,915 lbs. and 1,796 lbs. per acre, respectively.

The results with selected seed show that in the average of 7 years oats from large seed produced about 8 bu. per acre more than from medium-sized seed, and 15½ bu. more than from small seed. Large plump barley seed gave nearly 8 bu. per acre more than shrunken seed in the average yields for 6 successive years. Broken barley yielded an average of 10.6 bu. less per acre than large plump seed. Split peas and broken wheat gave very poor results. The results obtained in 1903 from experiments in the continuous selection of seed oats in progress for 11 years were as follows: Large plump seed, 76.9 bu.; light seed, 57.7 bu., and hulled seed, 72.2 bu. per acre. The crop from the large plump seed showed the heaviest weight per bushel. The hulled seed produced the largest proportion of hulled grains.

The greatest yield from different proportions of oats and barley was obtained this season from one bushel of oats and ½ bu. of barley per acre. In a second test in progress for 2 years the average results are in favor of a mixture of 1 bu. of oats, 1½ bu. of barley, and ½ bu. of emmer, the yield being 2,673 lbs. per acre. The smallest yield, 2,591 lbs., was obtained where grass peas were sown with the oats and barley. Methods of cultivation for oats and barley have been compared in duplicate for 3 years on an average clay loam soil. The largest yield of grain per acre of both crops was secured where the land was cultivated 3 in. deep and then drilled and rolled. Different treatments for the prevention of smut in oats and winter wheat were again tested, and the results were practically the same as those in previous years.

A comparison of seed wheat and seed oats from Missouri and Ontario is in progress, and the results to date show that the southern oats produced the largest yield, while the Ontario oats were best in quality. This season Dawson Golden Chaff wheat from Ontario gave slightly better results than that obtained from Missouri.

The average results obtained from sowing 2 varieties of winter wheat on different dates for 9 years indicate that the seeding should be done the last week of August or the first 10 days of September. For 6 years spring wheat, barley, oats, and peas were sown on 6 different dates, the first seeding being made as soon as the ground was in proper condition, and the others at weekly intervals afterwards. The average results were in favor of the earliest seeding with spring wheat, and of the second seeding with the other crops. It is further indicated that the order of sowing should be as follows: Wheat, barley, oats, peas. After the first week the average decrease in yield per acre for every day's delay in seeding amounted to 56 lbs. with oats, 53 lbs. with barley, 29 lbs. with spring wheat, and 23 lbs. with peas. Spelt and emmer were sown this season at weekly intervals on 8 different dates, beginning with April 2. Emmer produced more straw and a heavier grain than spelt from each of the seedings. For the first and the last dates of seeding for emmer and spelt the yields of grain were 4,297 and 3,103 lbs. and 3,499 and 658 lbs. per acre, respectively.

Sowing winter wheat at the rates of 1, 1½, and 2 bu. per acre gave average yields for 6 years of 40.2, 43.3, and 43.9 bu. per acre, respectively. Broadcasting the seed by hand gave practically the same results as drilling it in with a machine. In one test, winter wheat after field peas, used as green manure, produced an annual average of 22.1 per cent more wheat per acre than after buckwheat plowed under; and in a second test, a crop following clover stubble produced 20.7 per cent more grain per acre than a crop following timothy stubble. In a 2-years' test 160 lbs. of nitrate of soda per acre increased the yield 18.8 per cent, or 7.2 bu. The results of 7 years' work show that the heaviest grain was obtained from thoroughly matured seed.

The different species of wheat are described and their importance for Ontario briefly noted. The following table presents the results of some of the best varieties of winter wheat grown at the college:

Average results with varieties of winter wheat grown for 5 years.

Varieties.	Color of grain.	Tons of straw.	Pounds per bushel.	Bushels per acre.
Dawson Golden Chaff	White	4.2	59.7	63.5
Imperial Amber	Red	4.4	61.0	61.0
Prize taker	White	4.2	59.0	60.3
Early Genesee Giant	White	4.5	59.9	60.1
Rudy	Red	3.9	61.0	57.7
McGarvin	Red	3.9	61.1	57.7
Egyptian Amber	Red	4.6	61.8	57.5
Early Red Clawson	Red	4.1	59.4	57.4
White Golden Cross	White	4.5	58.9	57.3
Buda Pesth	Red	3.9	61.3	57.2
Michigan Amber	Red	4.6	60.2	55.4
Treadwell	White	4.0	61.0	54.2
Turkey Red	Red	3.7	61.5	53.4
Bulgarian	White	3.9	61.1	53.0

The average yield for 9 years of Polish wheat (*Triticum polonicum*) was 22.3 bu. per acre and of Wild Goose (*T. durum*) 35.1 bu. At the college the average yield of emmer for 4 years has been fully 72 bu. per acre by measure. All comparisons of emmer and spelt conducted by the author were in favor of emmer. For the last 2 years the average weight per measured bushel of emmer was about 10 lbs. greater than that of spelt. The straw of emmer was very clean, being almost free from rust.

The average yields for 5 years of Mammoth and Common winter rye were 4 tons of straw and 60.8 bu. of grain, and 4.1 tons of straw and 57.2 bu. of grain per acre, respectively. The yields of spring rye were decidedly smaller. Winter barley was found to completely winterkill in some years, but when it survived high yields of grain were obtained, the average for 7 years being 68.7 bu. per acre. The following average yields were secured in 10-year tests with varieties of 6-rowed barley: Mandscheuri, 70.9; Oderbrucker, 66 bu.; Scotch Improved, 66.2 bu.; Common Six-rowed, 65.5 bu.; Mensury, 64 bu.; and Success, 47.8 bu. per acre. For the last 5 years California Brewing, Mandscheuri, Common Six-rowed, Oderbrucker, and Scotch Improved have given the best yields. Among 2-rowed varieties of barley under comparison for 10 years, Canadian, Vermont Champion, Gold Foil Hansford, New Zealand Chevalier, and French Chevalier produced the greatest yields. In 1903, Imported No. 5591 and Hanna No. 5590 varieties, obtained through this Department, led in productiveness. Of 8 varieties of Hulless barley grown for 10 years, the following gave the highest average yields: Guy Mayle, 48.8 bu.; Black Hulless, 45.6 bu.; and Purple, 45.2 bu. per acre. Eight varieties of oats have been under test for 15 years and of these Joanette, Siberian, and Oderbrucker ranked first, yielding 88.9, 87.2, and 81.5 bu. per acre, respectively. The average results for 5 years with 25 varieties show that the best yields were secured from Siberian, Liberty, American Banner, German, Rust-Proof, and Michigan Wonder, in the order given. In 4 years' experiments in growing 9 early varieties of corn for grain production, King Phillip ranked first with a yield of 58.1 bu. per acre, and Compton Early last with a yield of 41.6 bu. per acre. California and Siberian millets and Hungarian grass are reported as good seed producers. For 3 successive years fall-sown hairy vetches produced an average of 10.8 bu. of seed per acre. The fall-sown vetches yielded a little more seed than those sown in the spring. The following varieties of beans have given the highest average yields for 7 years: White Wonder, 22.8 bu.; Pearce Improved Tree, 22.2 bu.; Medium or Navy, 21.7 bu.; Burlingame Medium, 21.6 bu.; Schofield Pea, 21.1 bu.; Day Improved Leafless, 20.8 bu., and Buckbee Electric Tree, 20.5 bu. of

seed per acre. Early Yellow soy bean has given good results as a grain producer and Medium Green as a forage crop.

The yields of different varieties of sugar beets are here reported, but the chemical analyses of the corresponding samples have been given elsewhere (see E. S. R., 15, p. 1072). Of 19 varieties grown for 4 years, 11 gave an average yield of over 20 tons per acre. In a 10-years' test with 8 varieties, Red Top, Lane Improved, and White Silesian headed the list with average yields of 19.8, 19.5, and 19.5 tons, respectively. Kleinwanzlebener gave an average yield of 18.81 tons per acre for 4 years. In 4 tests during 2 years, drills 18 and 20 in. apart produced an average of about 2 tons per acre more than drills 28 in. apart. Thinning experiments made in duplicate in 1903 with the Kleinwanzlebener variety showed that an increase in the average size of the root, together with a gradual decrease in the yield, took place as the distance between plants in the row increased from 2 to 10 in. Planting sugar beets on the level gave over a ton of beets more per acre than planting on ridged land. Four tests made in each of 5 years with selected beet seed resulted in the following average yields: Large seed balls, 22.9 tons; medium-sized seed balls, 21.9 tons; small-sized seed balls, 14.3 tons. In 2 tests made this season an average of 15.8 tons per acre was obtained from seed soaked 12 hours, as compared with 13.9 tons from unsoaked seed.

The largest yields of sound potatoes per acre in 1903 were as follows: Empire State, 336.7 bu.; Pearl of Savoy, 325.4 bu.; Seedling No. 230, 322.1 bu.; Up-to-date, 315 bu.; Salzer Earliest, 312.9 bu.; American Wonder, 312.1 bu.; White Elephant, 309.1 bu.; Dempsey Seedling, 306.3 bu.; New Main Crop, 288.8 bu., and Howe Premium, 281.7 bu. The percentage of rotten potatoes of each variety for the season is also given. Of different varieties tested for 10 successive years, Empire State, Pearl of Savoy, Rose New Invincible, Rural New Yorker No. 2, American Wonder, and White Elephant have been among the best yielders. This season the following sorts produced the largest average yields 9 weeks after planting: Acme, 233 bu.; Early Dominion, 215 bu.; Early Andes, 214 bu., and Early Ohio, 210 bu. per acre. The average yields in this test for 8 years were as follows: Stray Beauty, 107 bu.; Early Ohio, 105 bu.; Early Dominion, 101 bu.; Howe Premium, 99 bu., and Burpee Extra Early, 79 bu. The results and cost of different methods of treatment for the potato beetle, as determined by experiments, are given. Bordeaux mixture, applied in combination with Paris green, reduced the rot.

Thirty-three varieties of mangels were under test this season. Yellow Leviathan and Sutton Mammoth Long Red, yielding 43.1 and 42.4 tons per acre, respectively, headed the list in productiveness. All other varieties yielded under 40 tons per acre. Among 15 varieties tested for 6 years in succession Yellow Leviathan, Sutton Mammoth Long Red, Oblong Giant Yellow, Mammoth Golden Giant, and Steele-Briggs Giant Yellow Intermediate ranked first, the yields being 33.5, 33.2, 32.6, 32.2, and 31.8 tons, respectively. In a comparison of unsoaked seed and seed soaked 12, 24, and 36 hours, the average yield for 2 years was in favor of the seed soaked 12 hours. The average results for 5 years show that the yield of mangels decreased as the depth of planting increased from ½ to 4 in. Better yields were obtained from unbroken seed balls of mangels and sugar beets than from those broken or crushed. On a series of plats the first crops of common red clover, alsike clover, and timothy were plowed under and the land then planted to mangels. The average results of the season show that the common red clover land yielded 2.1 tons and the alsike clover land 3.6 tons per acre more than the timothy land. The average results for several years in comparing varieties of swedes, fall turnips, carrots, and parsnips, were in favor of Sutton Magnum Bonum, Red Top White Globe, Mammoth Intermediate Smooth White, and Improved Half Long, respectively, the yields being 21.5, 27.5, 31.3, and 11.8 tons per acre, in the order indicated. Planting carrot seed ½ and 1 in. deep gave the same average results for 10 different tests, while planting at greater depths reduced the yield considerably.

The following varieties of corn led in the production of silage in 1903: New Century Wonder, 29.3 tons; Cloud Early Yellow, 26.9 tons; Eureka, 26.9 tons; Pennsylvania Early Dent, 26.4 tons; Mastodon Dent, 26.3 tons; and 100 Day Bristol, 26.2 tons. The average data from different depths of planting show the greatest yield of total crop and ears from planting 2 in. deep. In 1902 and 1903 corn cultivated deeply immediately after planting and shallower as the season advanced gave a better yield than corn cultivated shallow at first and deeper latter on. The results obtained with 15 varieties of sorghum, including sugar cane, broom corn, Kafir corn, milo maize, and other varieties, are given in a table. The greatest yields of forage were obtained from the varieties of sugar cane. The yields of varieties of sunflowers, millet, rape, kale, cabbage, and other forage crops are also given.

Sixteen mixtures of grasses and clovers, each consisting of one grass and one clover, were tested 4 times with an average yield for all of 3⅓ tons of hay per acre. The average yield for the second year after the seed was sown was 4 tons, and the third year 2.7 tons. Alfalfa and tall oat grass head the list with an average yield of 4.41 tons per acre, followed by alfalfa and timothy, alfalfa and orchard, and alfalfa and tall fescue, with yields of 4, 3.84, and 3.78 tons per acre, respectively. A mixture of 8 grasses and 5 clovers in different proportions, amounting to 35 lbs. of seed per acre, and one of 5 grasses and 4 clovers, amounting to 24 lbs. per acre, have been under test for 9 years and have furnished 21 cuttings. The average yield of hay per acre for the first mixture was 4.47 tons, and for the second 5.14 tons.

Corn culture, R. J. REDDING (*Georgia Sta. Bul. 62, pp. 81–98*).—Previous work of this kind has already been noted (E. S. R., 14, p. 855). Sixteen varieties were tested but unfavorable conditions interfered with the results. Marlboro Prolific gave the best yield, and of this variety 175 ears were required to shell one bushel, while of Henry Grady, which stood second, only 115 ears were required. The average number of ears to the bushel for the best eight varieties in the test was 156 and for the remainder 137.

In comparing methods of harvesting in 1901 and 1903, it was found in each year that cutting the stalks and curing them in the shock gave the best returns. The stalks in the experiment of 1903, rated at 50 cents per 100 lbs., were worth $8.41 per acre.

Planting corn on beds and in the water furrow gave practically equal results, and applying cotton seed composted for several weeks about one week before planting showed no advantage over the use of crushed cotton seed used in the same way.

The results of a tillage experiment indicate that cultivation once a week for corn on unfertilized land is better than less frequent but more thorough working of the soil, while on well-fertilized land the more thorough tillage at longer intervals is the more advantageous.

Fertilizer tests with different applications of equal cost did not give conclusive results, but they indicated that the larger proportion of cotton-seed meal, furnishing nitrogen, is of greater benefit under the prevailing conditions than a larger proportion of acid phosphate and muriate of potash. On the fertilized plats an average of 76 per cent and on the unfertilized plats an average of 67.1 per cent of a perfect stand was obtained.

Cooperative variety tests of corn in 1902–3, T. L. LYON (*Nebraska Sta. Bul. 83, pp. 20, map 1*).—Nineteen varieties were tested by 59 farmers in various parts of the State. For the purpose of the experiments the State was divided into 6 sections corresponding in general with the variations in the natural vegetation. Not more than 12 varieties were grown in any one section. The larger varieties were grown in the eastern, the late maturing varieties in the southeastern, the early maturing sorts in the northern and western, and the smaller eared varieties in the western sections. The results of germination tests of the seed used and the yields obtained at the station and by a number of farmers in the different sections are shown in tables, and

the characters of each variety together with a brief history and statement of the source of the seed used are noted.

With the notable exception of Reid Yellow Dent, the introduced varieties did not give as good results as those grown from seed produced within the State. The late maturing varieties gave better yields than the earlier ones and the yellow varieties were in general better yielders than the white varieties. Neither the proportion of corn to cob nor the size of the ear seemed to bear any relation to the yield. Of the introduced varieties Reid Yellow Dent, Boone County White, Leaming, and Silver Mine are considered promising varieties and capable of being adapted to Nebraska conditions.

Increasing the yield of corn, A. M. SOULE and P. O. VANATTER (*Tennessee Sta. Bul. Vol. XVII, No. 2, pp. 25–48, figs. 11*).—The experiments in improving the yield of corn here described represent cooperative work between the station and the Bureau of Plant Industry of this Department. The importance of increasing the yield within the State is discussed, and directions for the improvement of varieties are given in addition to experimental results.

Of 62 varieties grown at the station only 36 of those under test for 4, 3, and 2 years are considered. The best average yields for 4 years were made by Hickory King, Champion White Pearl, Improved Leaming, White Rockdale, and Early Leaming, producing 46.87, 43.11, 42.13, 41.66, and 41.51 bu. per acre, respectively. The smallest percentage of cob, 13.09 per cent, was shown by Hickory King, and the largest, 27.07 per cent, by Large White Flint with Yellow Creole and Improved Leaming, with 27.78 per cent and 19.76 per cent, respectively, ranking next. Among the varieties grown for three years Wisconsin Early White Dent, Reid Yellow Dent, and Virginia Horsetooth, yielding on an average 43.52, 43.11, and 42.30 bu. per acre, respectively, were leaders.

The authors recommended the following varieties for different Tennessee soils: For light uplands, Hickory King, Early Leaming, Iowa Gold Mine, 100 Day Bristol, and Golden Beauty; for soils of medium fertility, Cocke Prolific, Virginia Ensilage, and Virginia Horsetooth; and for rich river bottoms, Huffman, Cocke Prolific, and Shaw Improved. In observing the influence of weather and soil it was found that Huffman on medium upland yielded 29.23 bu. per acre in 1900, 8.93 bu. in 1901, 59.48 bu. in 1902, 24.55 bu. in 1903, and an average of 30.55 bu. for the 4 years.

Culture tests were made with Hickory King and Cocke Prolific. Hills of 2 stalks each were planted at distances of 30, 36, 42, 48, 54, and 60 inches. The average results for 3 years with Hickory King were as follows: 30 in., 48.93 bu.; 36 in., 45.15 bu.; 42 in., 42.49 bu.; 48 in., 42.52 bu.; 54 in., 37.44 bu., and 60 in., 32.56 bu. The results with the other variety were similar. At 30 inches the yield was largest, but the ears were small and deformed, while at 48 in. the form of the ear and the quality of the grain was good. The following statement is based upon the results obtained: "One hundred acres of Hickory King planted at 48 in. would have yielded 500 bu. more grain than if planted at 54 in., and 1,000 bu. more grain than if planted at 60 in."

In selection experiments it was noticed that there was a variation of 7 to 19 days in the dates of ripening and from 9.8 to 14 tons in the yield of green crop and from 54.65 to 68 bu. in the yield of ears per acre with Cocke Prolific corn planted in single rows.

In fertilizer experiments, Cocke Prolific on a plat receiving 8 tons of barnyard manure per acre produced 22.10 bu. more than on the check plats. Where 25 bu. of lime per acre was applied the increase was 20.09 bu., and where a complete fertilizer consisting of 100 lbs. of nitrate of soda, 150 lbs. of acid phosphate, and 50 lbs. of muriate of potash was used the increase was 18.31 bu. For Hickory King the fertilizer applications proved of but little value, the gains over the check plats being as follows: From lime, 7.28 bu.; from barnyard manure, an average of 6.77 bu.; and from the complete application only a little over 3 bu.

The crop of corn, J. A. JEFFERY (*Michigan Sta. Spec. Bul. 22, pp. 15, figs. 2*).—This popular bulletin presents statistics on corn production, points out the value and uses of the crop, and discusses briefly methods of culture and improvement. A series of questions with reference to the production, value, uses, and culture of corn are given "to arouse in the reader a desire to answer some things for himself." The bulletin is intended for use in the study of the corn crop.

What kind of corn shall be planted for silage? J. L. HILLS (*Vermont Sta. Rpt. 1903, pp. 284–287*).—Four varieties, Sanford, Red Cob, Leaming, and a dent corn variety from Virginia were grown in 1900 and 1901 on different kinds of soil. Sanford is a relatively small flint corn, while the other varieties are of a larger type. As compared with Sanford the larger varieties produced from 50 to 70 per cent more gross weight, but an average of only 10 per cent more dry matter.

In the silo Sanford and Red Cob, the drier varieties, lost only 2 per cent in total weight, while Leaming and the Virginia Dent corn lost 20 per cent. The loss of dry matter in Sanford and Red Cob silage was slight, while in the other 2 varieties it amounted to 14 per cent. Sanford silage in a feeding test with dairy cows proved to be a better milk producer than silage from the larger varieties. Analyses of the different varieties as they were harvested and as they came from the silo show that Sanford was a little richer in protein and contained a much larger proportion of the desirable and a smaller proportion of the less desirable carbohydrates than the other varieties. It is believed that owing to the greater maturity of the Sanford its dry matter contained less potash than the dry matter of the other sorts.

Crops for the silo, A. M. SOULE and J. R. FAIN (*Tennessee Sta. Bul. Vol. XVII, No. 1, pp. 24, figs. 9*).—In the introduction the authors compare the carrying capacity of land when grazed and when producing silage crops, and note briefly the merits of different plants grown for silage, of which corn and sorghum are considered the most important. The results of experiments to determine the cost of cultivating silage crops and the cost of producing silage are reported.

Sorghum and corn and sorghum were planted in rows 2, 2½, 3, 3½ ft. apart. Corn and soy beans were grown in rows 3 and 2 ft. apart, respectively. The average cost of a ton of silage from sorghum, corn, corn and sorghum, and soy beans was $1.41, $2, $1.86, and $2.83, respectively. The yield varied considerably with the distance of planting. While the largest yield of sorghum, 19.8 tons per acre, was obtained from the closest planting, it is believed that 3-foot rows for sorghum, corn, and corn and sorghum are more desirable, when the convenience and cost of cultivation are considered. The cost of growing an acre of sorghum, corn, corn and sorghum, and soy beans for silage was $19.48, $14.92, $19.14, and $19.86, respectively.

Cocke Prolific and Virginia Ensilage corn were grown for 3 years on a total area of 40.93 acres. The largest yields were obtained from 3-foot rows. These varieties matured on an average in 108 days and produced 7.15 tons per acre at a cost of $2.21 per ton. It is estimated that in favorable seasons the cost of producing corn silage need not exceed $1.50 per ton.

During the last 4 years a total of 32.96 acres of sorghum was grown at the station and the silage obtained from the crops was produced at an average cost of $1.52 per ton. Of the varieties grown Red Head, partly because it stands up well, proved to be one of the best for silage purposes. The average rate of seeding in these tests was 7.3 lbs. per acre, and the average number of days required for the crops to mature 113. It is stated that as a first crop sorghum will yield from 12 to 20 tons per acre, while from the second crop not more than from 8 to 9 tons can be expected. The cost of silage per ton from first crops ranged from $1.15 to $1.78. The average cost from second crops was about $2.80. Red Head sorghum and Virginia Ensilage corn were grown in combination with satisfactory results.

The effects on the quality of silage, the yield, and the cost of production were all in favor of growing these crops together, as compared with corn alone. Grown in com-

bination the crops required 114 days to mature and yielded on an average 10.4 tons per acre, at a cost of \$1.85 per ton. The lowest cost per ton was \$1.41 and the highest \$2.08. In one instance the combined crop consisted of 66 per cent of corn and 34 per cent of sorghum, and in another 45 per cent of corn and 55 per cent of sorghum. It is suggested that about 12 lbs. of corn and 5 lbs. of sorghum seed be used per acre and planted in rows $2\frac{1}{2}$ or 3 ft. apart. Peas were grown with corn and sorghum for the purpose of increasing the protein content of the silage, but the quantity of the peas in the crop never exceeded 15.1 per cent, and in some instances amounted to only 5 or 6 per cent. This quantity was insufficient to materially influence the composition of the silage.

Mammoth Yellow soy beans produced an average of 7.5 tons per acre. About $\frac{1}{2}$ bu. of seed was used per acre. The crop required 138 days to mature, and the cost of the silage per ton was \$2.83. The silage was not palatable to cattle, and the authors believe that soy beans for silage should be grown with corn or sorghum rather than alone.

The use of fertilizers in connection with these experiments showed that heavy applications are not always satisfactory. The results indicated that the use of from 100 to 150 lbs. of high-grade acid phosphate and from 25 to 50 lbs. of muriate of potash will often prove profitable. Barnyard manure is considered the best fertilizer, and 5 tons of it per acre applied annually more effective than 10 to 15 tons at a time.

Notes are given on harvesting silage crops, filling the silo, and the use and value of silage.

Cotton culture, R. J. Redding (*Georgia Sta. Bul. 63, pp. 101–130*).—The experiments here described are similar to previously reported work (E. S. R., 14, p. 1060). The results of a test of 21 varieties are reported in a table. The total value of lint and seed per acre at 12 cts. per pound of lint and 70 cts. per 100 pounds of seed, amounted to \$78.17 in the case of Cook Improved, the leading variety, and in the cases of Prize, Moss's Improved and Texas Bur to \$67.24, \$66.92, and \$65.26, respectively. The values for all other varieties ranged from \$51.40 to \$64.32. Cook Improved and Texas Bur also stood among the 4 earliest varieties.

For the past 10 years a number of varieties have been grown for the purpose of comparing the relative merits of the half which were most productive each year with the remaining less-productive sorts. The results for the entire series of years shows that the average yield of lint, based on the production of seed cotton, was 34 per cent and 32 per cent for the most productive and the least productive varieties, respectively, the number of bolls to the pound, 70.4 and 76.1, the number of seeds to the pound, 4,124 and 4,179, and the average of total yield harvested to the time of the second picking, 56.3 per cent and 58 per cent. The leading varieties grown in this test are briefly noted.

This season Schley, a medium early variety, gave a better yield than either Mascot, an early sort, or a mixture of these 2 varieties; but the average results for 6 years are in favor of the mixture, which consisted of an equal number of seeds of the varieties.

As in former years a nitrogen test was conducted, using different fertilizer applications, each representing a cost of \$4.15, but with an increase in phosphoric acid and potash and a decrease in nitrogen in the series. The best returns were obtained from 250 lbs. of acid phosphate, 25 lbs. of muriate of potash, and 200 lbs. of cotton-seed meal, the value of the increase in yield at 4 cts. per pound of seed cotton amounting in this case to \$15.04. This application contained 8.98 per cent of phosphoric acid, 2.68 per cent of potash, and 3.26 per cent of nitrogen. A potash test on the same general plan as the nitrogen test just noted was conducted on two 1-acre fields. In this case the applications represented a cost of \$6.50 each per acre. The first field did not give very uniform results, but the first series, consisting of

an application of 520 lbs. of acid phosphate, 65 lbs. of muriate potash, and 195 pounds of cotton-seed meal, containing 11.33 per cent of phosphoric acid, 4.25 per cent of potash, and 1.94 per cent of nitrogen gave the best returns, the value of the increase at 4 cents per pound of seed cotton being $22.13. On the second field this application showed an increase in yield worth $24.93, while an application of 628 lbs. of acid phosphate, 13 lbs. of muriate of potash, and 235 lbs. of cotton-seed meal, containing 12.19 per cent of phosphoric acid, 0.75 per cent of potash, and 2.08 per cent of nitrogen was accompanied by an increase in yield worth $31.09. The author concludes from these results that a fertilizer for cotton should contain the 3 elements in approximately definite proportions to each other.

On fertilized plats, cotton planted on beds gave a yield of 1,407 lbs. of seed cotton per acre, as compared with 1,419 lbs. from a planting on the level. On 2 unfertilized plats the yields were 1,141 lbs. and 1,038 lbs. for planting on beds and on the level, respectively.

Bedding on the fertilizer in the usual way gave better results than applying it with the seed. The results of this test further showed that the 130 lbs. of cotton-seed meal contained in the application of 604 lbs. of fertilizer per acre did not interfere with the growth of the seed.

The bulletin contains a review of the weather conditions for this and previous seasons and suggestions on cotton culture with special reference to the use of fertilizers in that connection.

Sea Island cotton in Porto Rico, R. M. WALKER (*Porto Rico Sta. Circ. 3, pp. 4*).—This circular issued in both English and Spanish editions consists of brief notes on preparing the soil for Sea Island cotton and planting, cultivating, and harvesting the crop under Porto Rico conditions.

The potato in England, F. W. MAHIN (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 432–434*).—Information is given regarding the Eldorado, Evergood, Sir John Llewellyn, and Northern Star varieties of potatoes, the first named being a recently introduced variety.

Methods and benefits of growing sugar beets, C. F. SAYLOR (*U. S. Dept. Agr., Office of the Secretary, Circ. 11, pp. 27*).—This circular is a brief popular treatise on the culture of the sugar beet. In addition to discussions of the different phases of beet culture the production of beet seed is described and the results of experiments with home-grown seed and with different fertilizer applications are reviewed. Tables are given showing the sugar content of beets from home-grown seed as determined at the Washington Experiment Station and the results of germination tests of foreign and home-grown sugar-beet seed secured in the Seed Laboratory of the Bureau of Plant Industry of this Department.

Tests of different varieties of sugar beets, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 45–50*).—Sugar beets were grown in 1903 on a clay-loam soil in rows 21 in. apart and the plants thinned to 8 in. apart in the row. The yield and feeding value, judged from the sugar content of the various varieties, were determined and compared with the results of the 2 previous years. In general the larger growing varieties were not equal in food value to the smaller ones. Kleinwanzlebener contained 17.4 per cent of the sugar in the juice with a purity of 88.3, and of the 33 varieties tested one was equal and 7 even better than this standard variety. The results of distance experiments show practically no difference in the quality of beets grown in rows 18 or 20 in. apart at intervals of 8 in. in a row. The best distance between rows depends upon the cost of cultivation and the yield, but spacing to 18 in. is usually recommended.

The data from fertilizer tests show that barnyard manure has a tendency to force growth late in the season. Sugar content and purity were lowest on this plat. Muriate of potash applied alone increased the yield more than any other single fertilizer, the increase being almost as large as with barnyard manure. When sodium

nitrate was applied with the potash, the increase was greater, and still more so when phosphoric acid and potash were used together. The omission of potash considerably reduced the yield. The results with 2,400 lbs. of lime per acre corresponded somewhat closely with the results from potash alone.

The composition of dried pulp and dried pulp and molasses is given and the sugar-beet industry of the province is briefly reviewed.

Composition of an ancient Egyptian wheat, H. SNYDER (*Minnesota Sta. Bul. 85, pp. 211, 212, fig. 1*).—A sample of emmer 3,700 years old was examined. After the removal of the chaff it showed well formed though somewhat dry and shriveled kernels, some of which were more perfectly preserved than others and had highly polished surfaces. As a whole the kernels looked as if they had been slightly parched. This, however, may have been due to slow oxidation. The chaff contained 11.79 and the kernels 3.94 per cent of ash. The phosphoric acid content of the ash was 41.1 per cent. These values indicate, in the author's opinion, that little oxidation had taken place. The total nitrogen in the wheat was found to be 3.5 per cent, equivalent to 21.87 per cent protein. The fuel value was 4.086 calories per gram.

"From the chemical examination of this sample, it does not appear to be materially different from modern wheat of the spelts variety.

"A microscopic examination of the wheat kernels showed the presence of starch grains identical in form and structure with the starch in modern varieties of spelt."

The germinating powers of the Egyptian wheat were tested, but none of the kernels showed any indications of germ activity.

Wheat and flour, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 41, 42*).—Samples of wheat grown in Manitoba and the Northwest Territories in 1902 were tested for their gliadin content and were compared in this respect with samples of the previous year. The samples of the year before contained from 63.3 to 67.3 per cent of the total nitrogen in the form of gliadin, as compared with 48.5 per cent for the wheat grown in 1902.

Macaroni wheat; its milling and chemical characteristics, J. H. SHEPARD (*South Dakota Sta. Bul. 82, pp. 3–34, pls. 6*).—A description of the samples of macaroni wheats analyzed in connection with these experiments is given and the method of milling the samples is discussed. The samples represented Russian and Mediterranean varieties, together with several varieties from various sources. The milling and chemical characteristics of macaroni wheat are considered, and the data obtained in the investigation are tabulated at some length. A summary of these data, which are calculated to the air-dry sample, is given in the following table:

Principal milling and chemical data for macaroni wheats.

Variety.	Number of analyses.	Mill products.			Crude protein.				Gluten in flour.		
		Bran.	Shorts.	Flour.	In whole wheat.	In bran.	In shorts.	In flour.	Wet gluten.	Dry gluten.	Water capacity of one gram gluten.
		P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Grams.*
Kubanka	11	19.17	13.04	67.73	13.71	13.90	13.69	13.53	44.66	15.35	1.95
Gharnovka	12	28.12	14.08	57.88	14.33	14.19	13.99	14.29	48.99	16.95	1.89
Arnautka	3	16.49	13.20	70.39	14.79	15.05	14.45	14.71	45.35	16.33	1.76
Black Don	6	27.38	12.75	59.80	14.51	14.62	13.63	14.15	47.78	16.55	1.85
Velvet Don	4	16.93	14.89	67.76	12.87	13.06	12.29	12.71	40.97	14.46	1.83
Pellissier	5	31.29	15.81	49.61	14.78	15.01	14.09	14.34	47.03	16.31	1.91
Medeah	5	30.90	15.60	53.93	14.35	14.85	13.66	14.98	52.65	17.30	2.04
Kahla	4	30.86	15.80	53.58	15.17	15.66	14.28	14.82	49.62	16.24	2.06
Algerian	3	31.86	15.08	54.11	15.08	15.06	14.29	15.07	47.61	16.37	1.88
Saragolle	1	21.98	14.10	63.32	12.01	12.91	12.23	11.63	39.22	12.94	2.03
Argentine	3	25.31	13.03	60.65	14.50	15.42	14.28	13.96	51.26	17.10	1.97
Walnak	1	30.38	14.04	56.34	13.43	13.96	12.61	12.76	42.97	14.72	1.92

Distribution of crude protein in macaroni wheats.

Variety.	Number of analyses.	Protein in 100 pounds of wheat and its mill products.				Distribution of total protein.		
		Whole wheat.	Bran.	Shorts.	Flour.	Bran.	Shorts.	Flour.
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*P. ct.*	*P. ct.*	*P. ct.*
Kubanka	11	13.71	2.62	1.79	9.23	19.48	13.26	66.93
Gharnovka	12	14.33	4.13	1.68	8.26	27.97	13.55	56.76
Arnautka	3	14.79	2.43	1.94	10.33	16.75	12.90	70.05
Black Don	6	14.51	4.25	1.72	8.35	28.14	12.01	58.34
Velvet Don	4	12.87	2.19	1.85	8.65	17.45	14.24	66.79
Pellissier	5	14.78	5.09	2.24	7.16	34.69	15.11	48.15
Medeah	5	14.35	4.58	2.13	7.66	31.99	14.92	53.26
Kahla	4	15.17	4.75	2.26	7.66	31.14	14.88	50.78
Algerian	3	15.08	4.78	2.12	8.18	31.79	14.41	54.06
Saragolle	1	12.01	2.84	1.73	7.36	23.65	14.40	61.28
Argentine	3	14.50	3.91	1.88	8.42	26.86	12.82	58.18
Walnak	1	13.43	4.24	1.77	7.19	31.57	13.18	53.54

The author points out that the Russian varieties have given better results than the Mediterranean wheats. Of the Russian wheats, Kubanka, Arnautka, Gharnovka, and Velvet Don are considered desirable sorts. The original imported seed of Kubanka contained 14.1 per cent of protein, and the crop grown on South Dakota soil in 1901, a favorable season, contained 18.8 per cent. In 1902, a wet season, the protein content of the crop from seed of the previous year was 13.9 per cent. The protein content varied not only with the variety but also with the physical condition of different samples of the same variety. The percentage of protein passing into the flour was largest with the Russian varieties.

A report on the range conditions of central Washington, J. S. COTTON (*Washington Sta. Bul. 60, pp. 45, figs. 18*).—After reviewing the physical features of central Washington, the author describes the range conditions of the region and enumerates, with brief notes as to their habits of growth and forage value, the different plants affording feed for stock on the winter and summer ranges. The methods of handling horses, cattle, and sheep on the ranges are discussed and suggestions for range improvement are given.

A list of the more important forage plants observed by the author, including 43 grasses, 11 rushes and sedges, 8 leguminous plants, and 8 salt sages and allied plants, is given, and the different species are briefly described. The value of cultivated forage plants for the region is also considered. The author believes that fencing and moderate grazing will greatly benefit the range, and recommends that where stock is pastured several pastures be provided, so that each season one of them may be given a chance to rest and reseed itself. It is suggested that the restoration of the native meadows would be materially benefited by sowing bunch grass seed on the thin places and by the more extensive use of the grasses and other forage plants capable of thriving under the prevailing conditions.

HORTICULTURE.

Report of the professor of horticulture, H. L. HUTT (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 88–95*).—The author outlines the work of instruction and investigation in his department during the year. Experiments were made in the cultivation and management of various fruits and cover crops. It was found that the best results were obtained when one cover crop was used alone. In cases where two or three were planted in the same orchard, one appeared to check the growth of the others. As the result of a test of 300 varieties of strawberries, the author recommends the following varieties for the whole season: Splendid, Wesley, Clyde, Warfield, Irene, Saunders.

Cook Islands horticulture, T. W. Kirk and W. A. Boucher (*New Zealand Dept. Agr. Rpt. 1903, pp. 423–434, pls. 9*).—The authors visited officially the different islands of the Cook group, and in their report give an account of the various horticultural products grown on each island and the possibilities of future commercial development.

Commercial gardening, M. A. Oshanin (*Promuishlennoe Ogorodnichestvo. Rostov: A. K. Oppel, 1904, pp. 231, figs. 159*).—Brief directions are given regarding the most successful methods of cultivating, harvesting, and marketing various garden crops, together with notes on the present extent of the industry in the region of Rostov.

Experiments in crossing sweet corn. A new variety: The Voorhees Red, B. D. Halsted and J. A. Kelsey (*New Jersey Stas. Bul. 170, pp. 22, pls. 4*).—This is an account of the development of a new variety of sweet corn by crossing Black Mexican upon Egyptian and selecting in successive years the ears showing the largest percentage of red grains.

The first cross was made in 1900, and in 1903 a very large percentage of ears came true to type. The mature grains of Black Mexican are black in color, while those of Egyptian are white. The ears of the new variety when picked green have a pink color and when mature they are red. The ears of Black Mexican are 8 rowed and of medium size, while those of Egyptian are 10 to 14 rowed and of large size. The cross obtained follows the Egyptian in size of ears and number of rows on the ear, but is perhaps a little earlier. It has the good qualities of both parents and in addition the pink color of the ears when prepared for the table. It has been named the Voorhees Red in honor of Director Voorhees of the station. A thousand packets of 25 grains each are offered for free distribution to farmers throughout the State.

Many of the details contained in the bulletin regarding the work in crossing have been previously noted (E. S. R., 14, p. 369). Supplementary to that work it was noticed that self-pollinated corn frequently produced albino plants, while such plants were never obtained from cross-pollinated corn. Illustrations are given which show the much greater vigor of cross-pollinated seedling corn as compared with the seedlings of inbred corn. The bulletin contains some historical notes concerning corn, notes on the botany and races of corn, with a list of the varieties of sweet corn in current seed catalogues.

Solanum commersonii and its rose, yellow, and violate-skinned varieties, Labergerie (*Rev. Vit., 21 (1904), No. 536, pp. 335–339, figs. 7*).—This relative of the potato was introduced into France by M. Heckel in 1901. Since then it has been under cultivation, and rose, yellow, and violet-skinned varieties have been obtained from it.

The violet-skinned variety seems to be most promising. This variety resembles the potato in appearance. The vines exceed 3.8 meters in length and are so vigorous as to suppress all other vegetation. The violet-colored flowers are paler than the primitive type, are without odor, and appear sterile. The stems produce numerous bulblets in the axils of the leaves. Some of these bulblets, without contact with the soil, attain a weight of 0.6 of a pound. The tubers are formed around the central stem in a compact mass emerging out of the soil. The flesh of the tuber is white, yellowish, and sometimes striated with violet or green. The flavor is reported as slightly aromatic. The form of the tuber is varying, but tends toward two types, round and flat. Some agglomerated forms weighed as much as 1,400 gm. Good, smooth specimens sometimes reached a weight of 800 to 900 gm. In good soil the yield in 1903 in one instance was at the rate of 103,000 kilos per hectare, while on a well-manured soil containing only a small amount of sand the yield was at the rate of 53,000 kilos per hectare.

One of the peculiarities noted in the culture of this plant was that when the stalks were replanted after the tubers had been removed new tubers formed, which, in

quality, were as good as those of the best varieties of early table potatoes. The plant appeared to be entirely resistant to disease, in spite of being in close proximity to a field of potatoes which were completely destroyed by disease.

The starch content of the tubers has been found by analyses to vary between 13.5 and 16 per cent. The flat form of tubers was found more edible and less watery than the round form. The tubers kept in perfect condition in storage. They appeared to do especially well in humid soils. In a plat receiving an abundance of irrigation water the tubers averaged about 300 gm. larger in size than in another part of the same plat not irrigated. The author notes that with the original form of the tuber planted in 1901 the flowers are very numerous and emit an odor of jessamine. The tubers, while relished by animals when cooked, were too bitter for human consumption. When 70 to 90 per cent of potatoes were destroyed by disease but 2 per cent of the *Solanum commersonii* was affected.

The onion (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 3, pp. 59–72*).—Reports by many farmers are given on the success obtained in the culture of onions from seed sent out by the Jamaica Department of Agriculture.

Ginseng, H. B. Miller (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 496–500*).—A summary of information regarding the preparation of ginseng for market, the value of different varieties in China, and related topics.

Symposium of progress of pomology in America, F. M. Hexamer et al. (*Proc. Amer. Pomol. Soc., 1903, pp. 49–71*).—This is composed of 7 papers which were read before the American Pomological Society at its meeting in Boston in September, 1903. The paper presented by F. M. Hexamer gives a general survey of the pomological progress in America during the past 50 years. That of W. C. Strong is devoted to the horticultural progress in New England during the same period. Progress in New York was discussed by W. C. Barry, in Ontario by W. T. Macoun, in Quebec by W. Craig, jr., in Nova Scotia by R. W. Starr, and in the Middle West by Col. G. B. Brackett.

A symposium of ideals in pomology, E. W. Wood et al. (*Proc. Amer. Pomol. Soc., 1903, pp. 106–123*).—Nineteen papers are here presented by as many different authors on such subjects as the ideal dessert pear, ideal raspberry, apple, fruit package, cluster of grapes, horticultural society, blackberry, text-book for the fruit grower, etc.

Report of special committee on revision of rules of nomenclature, W. A. Taylor et al. (*Proc. Amer. Pomol. Soc., 1903, pp. 39–43*).—This is the report of the committee appointed by the American Pomological Society to revise the rules of the society on fruit nomenclature. The code of pomological nomenclature adopted (E. S. R., 15, p. 206) is printed in full.

Report of committee on nomenclature and standards, W. A. Taylor et al. (*Proc. Nat. Nut Growers' Assoc., 1903, pp. 34–39*).—This report follows closely the code adopted by the American Pomological Society for pomological nomenclature. In addition a scale of points is given for the guidance of the association in the judging of commercial varieties of pecans.

Judging fruits by scales of points, F. A. Waugh (*Proc. Amer. Pomol. Soc., 1903, pp. 131–138*).—A paper read by the author before the American Pomological Society at its meeting in Boston in 1903. The scale of points for judging fruits established by the Massachusetts State Board of Agriculture is given, together with the score cards used in Ontario for apples, pears, and grapes, and the score cards used by the author in his class work at the Massachusetts Agricultural College for apples, peaches, and plums. The score card used by J. R. Reasoner, of Illinois, in judging strawberries is included.

Best fruits for Utah planting (*Utah State Bd. Hort. Bul. 9, pp. 18–22*).—A list is given of the varieties of apples, peaches, pears, cherries, apricots, grapes, and berries, and bush fruits best adapted for home culture and in commercial orchards.

The fruit industry of Jamaica, W. E. Smith (*Proc. Agr. Soc. Trinidad, 6 (1904), pp. 18–34, pls. 2*).—The author visited Jamaica and here reports the results of his observations on the fruit industry of that island, more particularly as related to bananas and oranges. The cost of clearing and preparing the land for bananas in that island is placed at £10 per acre, and the net profits under good management about £10 per acre. The author suggests the desirability of this industry for Trinidad, provided it can be operated upon a sufficiently large scale to induce the regular visitation of fruit vessels during the shipping season.

The fruit supply of Auckland, W. A. Boucher (*New Zealand Dept. Agr. Rpt. 1903, pp. 438–442, pls. 9*).—Some statistics are given on the importations of fruit and on the present status of the citrus and deciduous fruit industry.

Fruit buds, P. Evans (*Missouri Fruit Sta. Bul. 10, pp. 14*).—Tables are given which show the percentage of a full crop of fruit buds which set on 118 varieties of peaches, 15 varieties of plums, and 6 varieties of cherries in the fall of 1903, the percentage of buds which were alive soon after the severe weather of January 26, 1904, and the percentage of leaves on the trees November 16, 1903. In addition, tables are given showing the maximum and minimum temperatures for each day of the months from April, 1903, to January 31, 1904, with the amount of precipitation on the same dates. It is expected that from these tables information can be obtained as to the relative hardiness of different varieties of peaches and the suitability of the same with respect to this point for use in breeding purposes.

Freezing points of fruit juices, J. B. Reynolds (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 13, 14, fig. 1*).—The freezing point of the juice of apples, plums, peaches, pears, grapes, and quinces was determined by the following method:

"A test tube about 6 in. long and ½ in. in diameter was placed erect in a larger vessel and was packed about with salt and ice, approximately in the proportion of one part of salt to two of ice by weight. This produced a very active freezing mixture. A small quantity of the juice was then poured into the test tube, a thermometer was inserted, the juice constantly stirred, and the temperature watched, the tube being lifted out of the freezing mixture from time to time for this purpose and the thermometer read through the tube. The temperature continued to fall until flakes of ice had formed throughout the juice, when a stationary point was reached. At this point the temperature remained until nearly all the juice was frozen, when it again began to fall. This stationary temperature was taken as the freezing point. As a check upon the work, the stationary point was watched for as the juice melted. It was found to correspond very closely with that observed during freezing."

The average results, which are taken as representing the minimum temperature for cold storage rooms, were as follows: Apples 29.3° F., plums 29.8°, peaches 29.66°, grapes 27.86°, pears, 28.88°, quinces 29.12°.

Storing nursery stock (*Nat. Nurseryman, 12 (1904), No. 3, pp. 31, 32*).—This article is based on the information obtained by observation and from letters of inquiry sent out to representative nurserymen. From the information obtained, it appears that the majority of nurserymen, especially the larger and more progressive, are using frost-proof winter storage facilities of one kind or another for nursery stock. It is believed that nursery stock is in a better condition to thrive when dug in the fall and stored in an even temperature approximating the freezing point than when allowed to stand in the nursery subject to wide fluctuations of temperature such as occur in winter.

Breeding apples in Minnesota, W. Elliott (*Proc. Amer. Pomol. Soc., 1903, pp. 124, 125*).—An account is given of the growing by Mrs. T. E. Perkins of seedlings from Malinda apple seed. The seed was planted in 1893 and in 1903 132 trees bore fruit. From these trees 109 kinds of apples, representing early fall, early winter, and late winter sorts were exhibited at the meeting of the American Pomological Society in Boston in 1903.

The seedless apple (*Fruitman's Guide, 17 (1904), No. 428, p. 1*).—This is a letter by John F. Spencer describing the characteristics of a new seedless apple which he has originated. Relative to the nature of the fruit Mr. Spencer states that there are stamen and pollen as usual, but no flowers or blossoms. The fruit resembles a small berry in shape. "It retains this appearance until half grown, and then assumes the shape and form of the fruit. The fruit loses none of its flavor because it is seedless and coreless. There is nothing but meat to the apple, save the small navel end, which has every appearance of the navel in the orange." Mr. Spencer states that he has been working to produce this seedless apple for the past 7 years. He considers it a revolutionary acquisition to the apple industry.

Commercial orchards of south Missouri, F. HORSFALL (*Missouri Fruit Sta. Bul. 8, pp. 12, map 1*).—Lists are given of the commercial orchards in 6 counties of southern Missouri showing the acreage of apples, peaches, pears, plums, grapes, strawberries, and blackberries planted. The territory reported upon lies between Springfield and Thayer, along the line of the Frisco railroad. A sectional map is given showing the location of the different orchards visited. The most of these are within 4 miles of the railroad.

In the 6 counties noted 348 orchards were visited. In these orchards there were 1,107 acres of apples of bearing age and 1,613 acres not yet come to bearing. Of the land devoted to peaches 5,491 acres were in bearing, and 1,232 acres not yet of bearing age. About 60 per cent of all the apples planted are of the Ben Davis variety, 7 per cent of the Jonathan variety, 4 per cent of the Gano, and small quantities of Ingram, Winesap, Missouri Pippin, etc. The Elberta made up 95 per cent of the peach trees planted.

Notes are given on the soils of the region and on the cultural methods generally observed by orchardists. The most common method of planting appears to be to crop the land in corn while the orchard is young and to sow it to grass or to let weeds or sprouts take it when it is old. Poor results are obtained in this way. In the best paying orchards the land is cropped with a rotation of corn, cowpeas, and rye as long as possible and then given clean, shallow culture. This is the method practiced at the station. Notes are also given on orchard insect pests and plant diseases most commonly found.

The date palm and its utilization in the Southwestern States, W. T. SWINGLE (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 53, pp. 155, pls. 22*).—This bulletin is the first of a series in which it is proposed to present complete life-history studies of crop plants, "treating the crop from every possible standpoint and bringing together all useful information." Such a treatment is here presented on the date palm. A considerable portion of the matter contained in the bulletin has already appeared in one of the Yearbooks of this Department (E. S. R., 13, p. 248).

In addition to such cultural details as the propagation of date palms, cultivation, pollination, harvesting, packing, etc., special attention has been paid to the heat requirements of this palm, its resistance to alkali in soil and in irrigation water, and to the suitability of the soil and climate of certain portions of the Southwest for date-palm culture. This matter, together with many original analyses of date-palm soils which were secured by the author in different portions of the Sahara Desert, is presented in great detail, accompanied by many comparisons of similar analyses made by other authors. The successful culture of the date palm for fruit appears to depend upon a high temperature and dry climate. "The date palm can endure any degree of heat and any amount of dryness in the air, and is even favored by hot winds and by a rainless summer. The best sorts can mature only in regions having a very long and very hot growing season."

A study of the alkali resistance of the date palm in the Sahara Desert shows "that although this plant can grow in soils containing from 3 to 4 per cent of their weight of alkali, it does not produce fruit unless its roots reach a stratum of soil where the alkali content is below 1 per cent, and does not yield regular and abundant crops

unless there are layers in the soil with less than 0.6 per cent of alkali. The surface soil may, however, be very much more salty and may even be covered with a thick crust of alkali. It is probable that amounts of alkali below 0.5 per cent of the weight of the soil exert no appreciable injurious influence on the date palm." So far as known, the date palm is more resistant to alkali than any other crop plant.

The Colorado Desert, or Salton Basin, is believed to be peculiarly adapted to date culture as it has a hotter, drier climate even than the Algerian and Tunisian Sahara, where the famous Deglet Noor, the most highly valued variety of date palm flourishes. The soil is also more fertile and the irrigation water of better quality. The Deglet Noor is a long-season variety, and the Salton Basin would appear to be about the only place in the United States where this variety can be successfully grown on a commercial scale. Many other earlier and mid-season varieties can be successfully grown in other regions of the Southwest and suitable locations for these sorts in California, Nevada, Arizona, New Mexico, and Texas are described in detail.

It is believed that there would be considerable profit in the culture of the date palm, particularly of the better varieties, and that little competition, if any, might be expected from Mexico, since in no place in Mexico or in the world, so far as known, are the conditions so favorable for date-palm culture, particularly of the Deglet Noor variety, as in the Salton Basin.

Relative to the culture of second-class dates and the ordinary dates of commerce, the author summarizes as follows: "It is very probable that the culture of the best second-class dates, suitable for employment in confectionery and for household uses, will prove a profitable industry in the Salt River Valley, Arizona, and it is possible that the Deglet Noor variety may mature there. Even the growing of ordinary sorts such as the oriental dates, which are imported into this country in enormous quantities, may pay in some favored regions, such as the flood plain of the Colorado River in Arizona and Calfornia, where exuberantly fertile lands can be had cheaply, and where the annual overflow and seepage from the river render artificial irrigation unnecessary. Although date palms are likely to be grown first on soils too alkaline for other crops, the culture of the finer sorts promises to be a most profitable fruit industry that would warrant planting on the very best lands and the employment of the most modern horticultural methods."

The bulletin is accompanied by a notable collection of illustrations showing different phases of date culture.

Persian Gulf dates and their introduction into America, D. G. FAIRCHILD (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 54, pp. 30, pls. 4*).—An account is given of the date industry about the Persian Gulf, including soil, climate, irrigation, descriptions of a number of the better varieties in the different date-producing districts, notes on the date as food, etc. In connection with the discussion on the varieties of dates their possible value for American conditions is pointed out.

Ripening persimmons (*Florida Agr.; abs. in Queensland Agr. Jour., 14 (1904), No. 3, p. 186*).—A method which has been found successful is here given for the hastening of the ripening of persimmons. In the experiment recorded the fruit of 20 red persimmons on a tree of 40 was punctured to the center about the middle of October by the big blade of a pocketknife. Within 8 or 10 days all the punctured persimmons were ripe while the other 20 persimmons on the tree were still red and hard. The puncturing of the fruit did not affect the taste or shipping quality, as the wound made soon closed up.

French v. American prunes and cherries, A. W. TOURGÉE (*U. S. Dept. Com. and Labor, Mo. Consular Rpts., 75 (1904), No. 284, pp. 352, 353*).—The French prune and cherry industry is briefly spoken of and the manufacture of brandied cherries and maraschino cherries is described.

Tests of small fruits, J. TROOP (*Indiana Sta. Bul. 99, pp. 61–68*).—From 100 to 150 varieties of small fruits have been grown annually at the station during the past 15 years. From the data thus accumulated notes are given on a number of the

newer varieties of strawberries and tabulary matter on the ripening period and relative vigor, productiveness, size, form, quality, etc., of 27 varieties of raspberries and 14 varieties of blackberries.

Among the older varieties of strawberries Brunette is recommended for people with impaired digestion. Clyde is especially recommended where one has only a small piece of ground. Gandy is considered one of the best late varieties. Warfield is excellent for canning. The experience of the station during the past 8 years has been in favor of subsoiling for raspberries and blackberries. The author is convinced that subsoiling 15 inches deep will pay well where the subsoil is hard and compact.

The development of the seedless currant berry, A. J. PERKINS (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 8, pp. 431–439, figs. 9*).—A record is given of some experimental work done to determine whether or not the seedless Zante currant forms fruit without pollination. Preliminary work showed that the pollen from Zante currants, as well as from a number of other varieties of grapes, germinated in sugar solutions. A number of illustrations are given showing the pollen grains and the different forms they assumed in germination. The size of the pollen grains was found to be not more than 3 or 4 times the size of ordinary yeast cells. The individual grains are invisible to the naked eye and can not be discerned even with the ordinary magnifying glass such as can be used out of doors.

In emasculating the Zante currants it was found that, notwithstanding the great care taken and the fact that the emasculation took place indoors instead of in the field, a few pollen grains regularly adhered to the stigma; and germination experiments showed that these pollen grains were sufficiently ripe to germinate and thus cause fertilization of the ovules. In normal fertilization of the currant it was found that the fertilized ovules increased in size for about 10 days and then finally aborted. A table is given showing the length and breadth of ovules of the Zante currant and of several other varieties of grapes at various stages of development.

From the results of the work the author concludes that the pollen of the seedless Zante germinates as freely as that of other seeded varieties; that the pollen is mature; and that it is extremely difficult, if not impossible, to avoid leaving pollen on the stigmas of vines when emasculating them 2 or 3 days prior to their expansion. It is held, therefore, that certain experiments which have been reported heretofore and in which emasculated flowers set fruits, are inconclusive as to the alleged absence of fertilization in the development of seedless fruit. Nothing in this experiment was discovered which would justify the assumption that fruit is produced in the ovule of the Zante currant without the intervention of pollen.

The condition of the coffee industry in Porto Rico, J. W. VAN LEENHOFF (*Porto Rico Sta. Circ. 2, pp. 2*).—Reasons are given for the present distressed condition of the coffee industry in Porto Rico, the primary cause of which appears to be the cyclone of 1899. It is believed that if Porto Rican coffee were better known in the United States there would be a greater demand for it.

Grape growing and raisin making in southern Utah, T. JUDD (*South. Utah Expt. Farm Bul. 1, pp. 14*).—A number of suggestions are made relative to the culture of grapes in southern Utah with reference to raisin making, and descriptions given of a number of varieties best suited for raisins. Thompson Seedless is recommended as the best grape of its class for the southern grape district of Utah. Thirty-five vines of Thompson Seedless grapes planted at the experiment station in 1900 gave an average yield of 13½ lbs. of grapes or 3½ lbs. of raisins per vine in 1903. One specially vigorous vine produced 8½ lbs. of cured rasins. Of the commercial table grapes the Black Cornichon has proved the best variety thus far tested. Forty vines planted in 1900 yielded an average of 11 lbs. of grapes each in 1903.

Suggestions are given for grafting grapes and on the use of resistant vines. The European varieties of grapes are the varieties grown. The phylloxera has not made

its appearance as yet in the vineyards of southern Utah, but as a future protection the use of resistant vines is urged.

Experiments with commercial fertilizers for grapes, E. Zacharewicz (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), Nos. 1, pp. 17–19; 2, pp. 37–40; 3, pp. 72–76*).—The varying results secured in cooperative fertilizer experiments with vineyardists in a number of different localities are here reported in more or less detail.

On the duration and variations in grafted vines, L. Degrully (*Prog. Agr. et Vit. (Ed. L'Est), 25 (1904), No. 13, pp. 383, 384*).—A controversial article in which the author points out that the variations in characteristics of vines due to grafting are not sufficient on the whole to cause vineyardists any apprehension. The thousands of acres of French vineyards which have been reconstructed on American stocks still continue in a thriving condition and produce an abundance of wine 20, 25, and 30 years after grafting. The subject of variations brought about as a result of grafting is wholly in an experimental stage, and as yet is of scientific interest only.

Notes on the reconstruction of French vineyards by grafting, L. Daniel (*Rev. Vit., 21 (1904), Nos. 532, pp. 210–215; 534, pp. 269–275; 535, pp. 301–305*).—Contrary to the general belief, grafting has been found to change the character of the scion graft as well as of the wine produced from the fruit grown on it. The variation in vine and product is due in a large measure to change in nutrition which takes place as a result of the callusing of the grafted parts, and the consequent greater difficulty of sap circulation. By taking advantage of the changes thus brought about it is believed that it will be possible to produce by grafting new varieties which shall combine the good qualities of the French grapes with the phylloxera resistance of the American sorts. Grape growing by the use of direct producers is considered highly desirable, and scientists are urged to experiment along the line of the production of new varieties, by means of grafting, which shall be direct producers.

Report of the viticulturist, R. Bragato (*New Zealand Dept. Agr. Rpt. 1903, pp. 451–461*).—This deals largely with the results secured in tests of varieties and in the analyses of must and wine obtained from European varieties of grapes. A paper read by the author at the recent meeting of the Auckland Fruit Growers' Union on phylloxera pest in vines is included in the article.

Experiments on the coloration of lilac flowers due to forced culture, E. Laurent (*Bul. Agr. [Brussels], 19 (1903), No. 5, pp. 659–669*).—It is stated that in the winter forcing of lilacs the flowers obtained are usually white; and this is true even when varieties normally producing violet-colored flowers are forced. The author made a series of experiments to determine the cause of the production of white flowers. The results obtained are recorded in detail, but they are conflicting and no general conclusions are drawn.

Pictorial practical chrysanthemum culture, W. P. Wright (*London and New York: Cassell & Co., Ltd., 1904, pp. 128, figs. 62*).—This is a practical treatise on the culture of home and show chrysanthemums, dealing with all the different phases of the plant from propagation to final exhibition. It is the sixth of this series, and as in the earlier numbers, pictures form a prominent and valuable feature of the book.

Alabama-grown bulbs for forcing, W. J. Stewart (*Amer. Gard., 25 (1904), No. 478, p. 223*).—This is a report on the blooming of the Paper White *Narcissus grandiflorum* and *N. princeps* from bulbs grown in Alabama. It is reported that the Paper Whites which flowered were very fine and fully equal to imported stock. "There were, however, a good many 'sets' in the collection, the bulbs evidently having been grown in a clump and taken up as such and separated." It is believed that had the sets been planted out as is done in general bulb culture and grown for one season they would have made a much better showing. The results with *N. princeps* were not so satisfactory, and in the opinion of the experimenter the climate of Montgomery is too warm for the growing of bulbs of this class.

Annual flowering plants, L. C. CORBETT (*U. S. Dept. Agr., Farmers' Bul. 195, pp. 48, figs. 55*).—This bulletin contains suggestions on the uses of flowers about the dwelling, plans for school gardens, general cultural suggestions, and special directions for the culture of about 50 annual flowering plants.

FORESTRY.

Forest fires in the Adirondacks in 1903, H. M. SUTER (*U. S. Dept. Agr., Bureau of Forestry Circ. 26, pp. 15, map 1*).—During the early summer of 1903 over 600,000 acres of timber land in northern New York were burned over, with a direct total loss of $3,500,000. The burned region was thoroughly studied by agents of the Bureau of Forestry for the purpose of determining the conditions which led to these fires and their immediate causes. The general conditions were favorable for fire on account of the unprecedented drought of the season. The fires varied according to the local conditions, being merely surface fires in some places and ground or crown fires in other locations.

Some of the more important fires in this region are described in detail and notes are given on the methods which were employed in fighting them. The most effective fire fighting was done between daybreak and 9 o'clock in the morning when the fires were least aggressive. All of the usual methods of fighting fire were adopted. The fires in general appeared to break out along the lines of railroad, and it is stated that there was a lack of proper patrolling of railroad tracks, indifference on the part of section men, and failure to use spark arresters on locomotives.

Reclamation of flood-damaged lands in the Kansas River Valley by forest planting, G. L. CLOTHIER (*U. S. Dept. Agr., Bureau of Forestry Circ. 27, pp. 5, fig. 1*).—The injuries caused in the Kansas River Valley by the flood of 1903 fall under 4 heads: Sanding of the land, erosion, deposition of silt, and caving of river banks. In reclaiming lands which were covered with sand it is recommended that cottonwood trees be planted at once in order to prevent the drifting of the sand to other fertile lands. Cottonwood seedlings germinated in immense numbers during the season of 1903 on lands which were too wet for cultivation and such seedlings may be used to plant as sand binders.

On eroded lands it is recommended that willows and cottonwoods be planted or that these trees be allowed to grow in order to assist in collecting silt and building up the soil to its former level.

In the protection of river banks against caving a successful scheme has been proposed by E. Bayles. This plan consists in fastening together willow poles 18 to 20 ft. long by means of wire and allowing these poles to remain in an inclined position against the banks. They gradually become covered with soil and take root.

Attention is called to the fact that cottonwood and catalpa are rapid growing trees and may be depended upon to produce valuable crops within a comparatively short period of years.

Reforesting mountain slopes, T. P. LUKENS (*Water and Forest, 4 (1904), Extra No. 1, p. 4*).—A brief account is given of the investigations of the author in the problems of reforesting mountains in southern California. The plan pursued consists in growing the trees in nurseries to an age of about 2 years, during which time they are frequently transplanted and finally planted during the wet season so as to become thoroughly established. Where trees were transplanted in this way a large percentage grew and seemed to be in a thriving condition. Where the mountain slopes are too steep or rocky to grow trees chaparral will be grown and data obtained to compare the relative value of chaparral and forest growth as mountain covers.

A study of California forests, W. C. HODGE, Jr. (*Water and Forest, 4 (1904), Extra No. 1, pp. 3, 4*).—A brief account is given of cooperative work in the study of

California forests carried on with the Bureau of Forestry of this Department. This work was made possible through a State appropriation which became available July 1, 1903. The work thus far performed consists of mapping and describing 17,250,000 acres of forest land, together with suggestions for its proper management, studies of the problems of fire destruction and prevention, and forest extension. A plan has been provided for fire protection which has been put in operation on a small scale on a tract of land in order to test the exact cost of such protection.

Under the forest extension studies, investigations have been pursued in the reproduction of the forests in the San Gabriel, San Bernardino, and San Jacinto mountains to determine the methods of forest reproduction. In the same regions a study is being made of chaparral to determine its extent, condition, and importance as a cover. Investigations are also being made on the growth and area of planted eucalyptus, as well as on problems of forest fires.

The revenue to be expended in this investigation up to December 31, 1904, is approximately $15,000, $6,028 of which is provided by the State of California, the balance, being salaries and other expenses, paid by the Bureau of Forestry of this Department.

An outline is given of the work to be pursued during the coming season, and estimates made as to its cost.

Planted pine in Nebraska, C. A. Scott (*Forestry and Irrig., 10 (1904), No. 2, pp. 77–79, fig. 1*).—A report is given of a plantation started 13 years ago in the sand hills of western Nebraska. The plantation consisted of about one-half acre and was planted in the spring of 1891 with 3-year-old seedlings in alternate rows of jack pine (*Pinus divaricata*), and Scotch, Austrian, Norway, and western yellow pine.

The jack pine seedlings were secured from forests, and about 50 per cent of them died during the first year. Since planting the trees have received no cultivation whatever, but have been protected from fire and stock with the result that fully 90 per cent of those surviving the first season have made a comparatively good growth. The jack pine has by its growth proved adapted to the conditions of the sand hills, the dominant trees averaging 19.4 ft. in height and 3 in. in diameter breast high, with the intermediate trees about 15 ft. in height. The estimated volume of wood on the half acre was 586.2 cu. ft. Many individual specimens of the other species of pines are making thrifty growth, but are hardly to be compared with those of the jack pine.

The blue gum, J. B. Anderson (*Forestry and Irrig., 10 (1904), No. 2, pp. 65–70, figs. 3*).—A study is given of *Eucalyptus globulus* and other species of the same genus in California. The forest characteristics of blue gum are described; its value as timber pointed out, and methods of planting, cultivation, etc., enumerated. The blue gum is said to be one of the most rapid growing trees, and on average soil in California will produce 500 cu. ft. of new wood per acre each year. In addition to *E. globulus* a number of other species of less extended distribution are enumerated and briefly described.

Practical forestry for lumbermen, O. W. Price (*Forestry and Irrig., 10 (1904), No. 2, pp. 60–63*).—This is an address given before the Southern Lumbermen's annual meeting at New Orleans, in which the author gives reasons for conservative handling of timber lands and the financial results that may be expected from such treatment.

Wood pulp and wood-pulping machinery (*Queensland Agr. Jour., 14 (1904), No. 1, pp. 44–46*).—On account of frequent inquiries regarding wood pulp and its manufacture, the department of agriculture of Queensland has prepared a statement showing the various kinds of timber suited for wood pulp and describes some of the more important processes in its manufacture. According to the article there are in operation in the United States 1,115 paper and pulp mills with an annual output of 2,500,000 tons of paper, the greater portion of which is made from wood pulp.

SEEDS—WEEDS.

Alfalfa seed, E. BROWN (*U. S. Dept. Agr., Farmers' Bul. 194, pp. 13, figs. 8*).—It is stated that the quality of the alfalfa seed offered on the market during the present season is very low, and special care is urged in buying seed in order to avoid poor and adulterated samples.

The adulteration of alfalfa seed appears to be accomplished chiefly by the addition of the seed of yellow trefoil or bur clover. The bur clover is used as an adulterant of alfalfa seed under the name of Chilean lucern. Intending buyers of alfalfa seed are urged to remember that the fresh seed is light olive green in color while brown seed is almost always dead. The appearance of dodder seed is also described. This has proved to be one of the most destructive weeds in alfalfa fields. It is recommended that no adulterated or brown alfalfa seed be bought and that samples be tested before buying in large quantities.

Temperature in relation to seed germination, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 9–11, figs. 2*).—An account is given of tests of different seeds at various temperatures ranging from 45 to 95° F.

"This investigation was carried on by means of a seed germinator, consisting of an interior oven surrounded on all sides by double walls, within which water is kept. Heat applied to the base of the apparatus maintains the oven at any desired temperature, the circulation of the water distributing the heat evenly within the surrounding walls. In the oven the seed is germinated between two concave plates laid face to face. On the lower plate a square of saturated blotting paper carries the seeds to be tested, another square of damp paper is laid over the seeds, and another plate laid face down over the whole. Fifty or one hundred seeds of one kind, according to their size and to the space available, are placed on each plate."

The average results are summarized in the following table:

Temperatures of germination.

Species.	Best.	Second.	Third.	Remarks.
	° F.	° F.	° F.	
Cabbage	80	68–72	90	Vitality impaired above 80°, below 68°.
Onion	80	90	....	
Parsnip	80	90	....	Vitality destroyed at 95°.
Cauliflower	80	68–72	55–65	Vitality impaired beyond 80°.
Oats	80	68–72	55–65	Do.
Beans	90	80	68–72	Mildewed at 95°.
Peas (smooth)	80	68–72	55–65	Vitality almost destroyed at 90°.
Peas (wrinkled)	68–72	....	....	
Wheat	68–72	55–65	80	Vitality impaired at 80°.
Barley	80	90	68–72	
Corn (dent)	80	90	68–72	Some mildew at 80°.
Peas (sweet)	68–72	55–65	80	Earlier germination, but impaired vitality at 80°.
Carrot	80	90	68–72	Vitality impaired beyond 90°.
Turnip (Swede)	80–90	68–72	....	Do.
Turnip (white)	90	80	68–72	Do.
Rape	90	80	....	
Beet (common)	80	90	68–72	
Beet (sugar)	80	....	....	
Clover (red)	90	80	68–72	Vitality impaired at 95°.
Clover (alsike)	80	68–72	90	
Radish	80	68–72	....	Mildewed at 90°.
Cucumber	90	80	68–72	Vitality impaired at 95°.
Tomato	90	80	68–72	Do.
Squash	80	90	....	

The bearing of the results on the methods of cultivation of the soil best suited to maintain proper conditions of heat and moisture for germination is discussed.

Respiration experiments with dry and moist oats, OLAF QUAM (*Norsk Landmandsblad, 23 (1904), No. 5, pp. 61–64*).—It is shown that the presence of a considerable quantity of moisture in the seed oats shortens the dormant period of the seed, and that if sufficient moisture is present the oats will germinate and develop into young plants.

Comparative respiration experiments with dry and damp Ligowo oats containing, respectively, 9.16 and 18.64 per cent water, showed that the following quantities of carbonic acid were exhaled during 5-day periods by 2.8 kilos of oats: By the dry oats, 0.0248, 0.0142, and 0.0200 gm. (total, 0.0590 gm.); by the damp oats, 0.8320, 2.4527, 2.4989 gm. (total, 5.7836 gm.); i. e., nearly 98 times more than for the dry oats.

On the assumption that this loss takes place at the expense of the starch in the grain, there is a 3 per cent larger loss in the total amount of starch contained in the oats in the case of the damp than in the dry oats, if the oats be kept for about 5 months. The money value of this loss to the oat grower is apparent. The destruction of the starch is accompanied by a decomposition of the fats, and the proteids may also be attacked; hence the importance of careful drying of grain.—F. W. WOLL.

Report on the work of the Stockholm Seed Control Station for 1902–3, O. STJERNQUIST (*Red. Verks. Stockholms Läns Hushållningssäll. Frökontrollanst., 1903, pp. 13*).—Statistical data are presented relative to experiments carried out by the station concerning the weight, size, purity, germinating power, and other characteristics of various kinds of seeds submitted for examination.

Notes on certain threatening weeds, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1903, pp. 169–173, figs. 3*).—Brief descriptive and economic notes on king-devil weed, creeping sow thistle, blue thistle, Russian thistle, clover dodder, and prickly lettuce.

The shrubby cinquefoil as a weed, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1903, pp. 173–190, pls. 4, figs. 5*).—During recent years in certain portions of southwestern Vermont, *Potentilla fruticosa* has become exceedingly aggressive and in some instances has taken complete possession of pastures and tilled lands. The authors describe this plant and give notes on its botanical relationship, habitat, and geographical distribution. The species occurs generally throughout the northern portions of both hemispheres and extends far south into the mountainous regions of Asia and North America. It appears to thrive best on calcareous soils. The use of the plant in the manufacture of coarse stable brooms has been suggested, but the plant appears to have no other economic value.

Among the methods of prevention or destruction the authors recommend mowing, burning, plowing, grubbing and pulling, and grazing with live stock. Sheep and cattle browse upon it to some extent, but goats are much more effective in destroying it. The hope is expressed that the Angora goat may control or entirely exterminate this shrubby cinquefoil, as well as hardhack and other shrubby weeds of Vermont pastures. The pest also yields to reforestation, and for this purpose the author recommends planting white pine, yellow locust, willows, and butternuts.

Spraying for wild mustard, J. L. STONE (*New York Cornell Sta. Bul. 216, pp. 107–110*).—Experiments were instituted by the author for the purpose of testing the value of copper sulphate in the destruction of wild mustard. It was found that young plants of wild mustard are more quickly and certainly destroyed than older plants.

Among the weeds which were destroyed by copper sulphate solutions mention is made of wild mustard, wild radish, wild barley, shepherd's purse, etc. Curly dock, black bindweed, dandelion, etc., were severely injured, while wild rose, pig weed, field thistles, etc., were not affected. It was found safe to spray this solution on cereals, grasses, peas, and sugar beets, while beans, potatoes, turnips, and rape were killed or injured. In the first list of crops, therefore, wild mustard may be destroyed by spraying with copper sulphate in a 3 per cent solution, at the rate of 40 to 50 gals. per acre.

Report of the biologist, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 21–32, figs. 13*).—The experiments and demonstrations conducted throughout Ontario have shown that wild mustard may be almost entirely eradicated by

spraying with copper sulphate at the rate of 9 lbs. to 45 gal. of water. One barrel of the solution is sufficient for an acre and costs about 90 cts.

The solution should be applied on a sunshiny day just as the wild mustard is coming into bloom. No serious harm is done by this application to barley, oats, or clover. Notes are also given on wild barley, rosin plant, and bracted plantain. A blight was observed on Egyptian peas and is believed to be due to *Ascochyta pisi*. A brief account is also given of raspberry cane blight and early and late blight of potatoes.

DISEASES OF PLANTS.

Preliminary treatment of seed grain as a source of vegetative energy, J. L. Jensen (*Tidsskr. Landbr. Planteavl, 10 (1904), pp. 46–63*).—The investigations of the author as to the prevention of grain smut, which led to the Ceres-powder and the hot-water methods, suggested that an increase in the vegetative energy of the seed might be brought about by an appropriate preliminary treatment of the seed, that would favor a more vigorous development of the enzyms of the germinating seed, without impairing thereby the germination of the seed through the heat or the chemicals applied.

It was recommended to use a temperature of 53 to 54° C. in the hot-water treatment for smut in oats, wheat, and rye, while for barley a softening of the grain for 2 hours in cold water and subsequent submerging in water of 50 to 51° was found necessary. By this method of preliminary treatment an increase of about 8.5 per cent of grain and a similar increase in straw was secured, as the average result of 53 trials conducted during 5 years, compared with seed not treated. At a temperature higher than 51° a diminished yield was obtained, e. g., as the average of 10 trials with grain treated at 52.5° a 3 per cent smaller yield of grain than when the seed grain was not treated.

Through the adoption of a proper method of disinfection of the seed and a longer time of treatment, viz, 4 to 5 days, an increase in the development of the ferments that transform the albuminoids during the germination is secured, which will result in a marked increase in the yields harvested. The average increase in the yields obtained by the 2 methods of smut prevention proposed by the author, followed by a 4 to 5 days of "fore-culture," during a series of years, are shown below. In these experiments 72 lots of oats and 53 of barley received the hot-water treatment and 54 oats and 45 barley were treated with the Ceres powder.

Increased yields due to treatment for smut prevention.

	Hot-water method.			Treatment with Ceres powder.	
	Oats.	Barley.		Oats.	Barley.
	P. ct.	P. ct.		P. ct.	P. ct.
1890 increase	11.2	8.1	1891–1894 increase	11.5	7.2
1891 increase	11.3	8.4	1895 increase	16.3	12.7
1892 increase	14.0	10.6	1896 increase	15.6	8.1
1893 increase	12.5	8.7	1897 increase	(8.3)	8.2
1894 increase	11.8	7.1			
Average	12.8	8.6	Average	12.9	9.0

Only about 1.25 per cent of the increase in the yield of oats and 0.25 per cent in the case of barley came from the eradication of the smut, the rest being due to the "fore-culture." In these experiments 25 per cent of the weight of the seed grain was added of steeping liquid, and this quantity was added in 6 portions in case of barley and in 3 portions in case of oats. Where the seed grain is not wet in a tank or a barrel, but on the barn floor, some of the liquid will be likely to drain off, and

it is therefore preferable to add the liquid in 6 portions also for oats under such conditions.

The author shows that the effect of preliminary treatment is restricted, and the increase in yield lessened, by a too short period of germination in the seed grain. Seed sown 1 to 4 days after the treatment by the hot-water method gave the following results, the yield from seed not treated being placed at 100: One day after treatment, oats, 106.4; barley, 107.9; 2 days after treatment, 116.1 and 111.0; 4 days after treatment, 125.7 and 113.0, for oats and barley, respectively.

The effect of only a few hours "fore-culture" of seed subjected to Ceres treatment proved to be unfavorable, the average yield obtained being 95.9 against 100 for seed not treated and 128.9 for treated seed which was sown after 4 days' "fore-culture." From the information at hand the author is of the opinion that enzyms will develop appreciably in seed grain even after a few hours' treatment, but the potassium sulphid of the Ceres liquid coating the seeds appropriates the available oxygen in the air and in the soil interstices directly after sowing, thus placing the treated seed somewhat at a disadvantage in the case of a too brief period of preliminary treatment.

Experiments with treatment of seed grain with a weak extract of malt gave an increase in the yields obtained at harvest time, in comparison with seed treated with water only, showing that the extract produced an increased vegetative energy, and indicating that the advantage observed in the "fore-culture" method comes from a formation of ferment during the progress of this culture.

The method of "fore-culture" proposed by the author consists in treating the seed grain with 25 per cent of its weight of Ceres solution, this being added in 6 portions and the grain shoveled over repeatedly once or twice a day for 4 to 5 days. By this time the germ will be just ready to break through the seed coat. With the quantity of liquid applied there is little danger that it will grow much longer, so as to render difficult the sowing by grain drill or otherwise. Studies of various phases of the "fore-culture" method, especially as regards its practical application, will be continued by the author.—F. W. WOLL.

Oat smut and its prevention, R. A. MOORE (*Wisconsin Sta. Bul. 111, pp. 10, figs. 2*).—Oat smut prevails largely throughout the State and has caused great losses, especially during the last 3 years. An inspection tour was made for the purpose of learning how extensively the formaldehyde or other treatment was employed by farmers in preventing this disease. Of the farms visited on this tour 87 treated their seed grain for smut and 245 did not. The disease is checked during wet seasons.

In treating seed the author recommends 1 pint of formalin to 36 gal. of water. This is sufficient to treat 30 bu. of oats. The oats should be left in the solution for 10 minutes. Barley smut may be prevented by a similar immersion in a solution containing 1 pint of formalin to 20 gal. of water.

Occurrence of plant diseases in Vermont in 1903, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1903, pp. 153–155*).—The early part of the season of 1903 was unusually dry, and this drought was followed by copious rains and cool cloudy weather. These conditions affected the time of appearance and prevalence of fungus diseases. Apple scab was less injurious than usual. Early potato blight did little damage until about September 1. The application of insecticides and fungicides was less effective than during normal seasons. A soft rot of turnip, onion mildew, and club root of cabbage were quite injurious.

Potato diseases and their remedies, L. R. JONES and W. J. MORSE (*Vermont Sta. Rpt. 1903, pp. 155–168*).—The results obtained during 14 years' experiments with potato diseases at the station indicate that the Bordeaux-arsenical mixture is superior to any other remedy. As a rule 2 applications have been found profitable. In 1903, however, the development of potato blight was checked by one application on account of the late appearance of the disease. One application of Bordeaux-

arsenical mixture produced a gain of 124 bu. per acre. The addition of Bug Death and Paris green to the Bordeaux mixture was apparently without much effect on account of the unusually small numbers of potato beetles and other insects. Neither Paris green nor Bug Death have any value in controlling potato blight, the Bordeaux mixture alone being quite effective.

Experiments were carried on for the purpose of determining the relation between the date of digging potatoes and development of the rot. Four rows of potatoes were dug on each of 5 days, that is, August 31, September 7, 14, 21, and 28. All of the potatoes were stored under similar conditions. The results indicated that whenever there is danger of rot it is best to delay digging the potatoes for 10 or more days after the tops die.

A test of sprinkling potatoes with air-slaked lime before placing them in the cellar showed that this method is of no value in controlling the development of the rot.

In experiments with potato scab it was found that corrosive sublimate and formalin were equally efficient. The formaldehyde gas treatment, however, is recommended as preferable for this purpose. An air-tight room is required, and it is recommended that not less than one pound of formalin be used for each 1,000 cu. ft. of space.

The dry rot of potatoes due to Fusarium oxysporum, E. F. Smith and D. B. Swingle (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 55, pp. 64, pls. 8, figs. 2*).—This disease of potatoes has long been recognized in the United States and foreign countries under various names, such as bundle blackening, dry end rot, etc. The authors made a study of the morphological and biological characters of the fungus, the methods of infection, and remedial measures.

The disease commonly enters the plants through the roots and slowly spreads until the whole underground portion of the plant is infected. In infected plants the fungus is always present in the darkened fibrovascular bundles of the tubers. The symptoms of infection are a slow change of color, the checking of growth, and slight curling of the leaves, followed by wilting and falling of the stems. The fungus grows readily in a considerable variety of culture media and tolerates comparatively large amounts of malic, citric, and tartaric acids. It is checked in growth, however, by formic, acetic, and butyric acids. The fungus is aerobic and grows most vigorously at temperatures between 15 and 30° C.

Dry rot attacks potatoes from the soil, and winters over in infected plants. The use of fertilizers, even in large amounts, failed to check the development of the disease. The fungus persists in stored potatoes, whether kept in moist or dry rooms, unless a low temperature is maintained.

It is recommended that infected land be planted to other crops for a number of years, and that the possibility of the disease infecting tomatoes, eggplants, and peppers be kept in mind. Great care should be exercised in the choice of seed tubers. Some difference in the resisting power of different potato plants to disease was noted, and further investigations will be conducted to determine whether highly resistant varieties may be developed.

Spraying fruit trees, E. P. Sandsten (*Wisconsin Sta. Bul. 110, pp. 28, figs. 12*).—The author discusses in a general manner the method of preparing and applying insecticides and fungicides and presents notes on the more important insect enemies and fungus diseases of fruit trees.

Spraying grapes for black rot in Erie County, Pa., G. C. Butz (*Pennsylvania Sta. Bul. 66, pp. 16, pls. 2, map 1*).—During the season of 1902 the vineyards of the Chautauqua grape belt were greatly injured by the attack of black rot. The disease was investigated by the station and arrangements were made to supervise experiments which were carried out by vineyardists. The Concord variety is grown almost exclusively in this region. The fungicide used in these experiments was Bordeaux mixture in the 4-6-50, 4-4-50, and 3-6-50 proportions. In some cases ammoniacal solutions of copper carbonate were used for later applications.

The results obtained were very satisfactory and furnished strong evidence in favor of spraying with Bordeaux mixture to prevent black rot. In one instance a saving of 33⅓ per cent was brought about by spraying.

Dust or powder sprays, J. CRAIG (*New York Cornell Sta. Bul. 216, pp. 111–117*).—A number of experiments were carried out for the purpose of determining the relative value and effectiveness of dry fungicides. It was found that the labor and expense of applying dust sprays were less than in the case of liquid sprays, but that more applications were required. The brown rot of peach and plum is apparently not controlled by fungicides applied in the dry form. It is recommended that dust sprays be applied in the early morning, late afternoon, or in damp weather. In general, it appears that there is no sufficient reason for adopting the dry spray in place of the wet form on grounds sufficiently level to admit the manipulation of a spraying outfit.

ENTOMOLOGY.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 6 (1904), No. 2, pp. 61–126, fig. 1*).—This number contains an account of the meetings of the Entomological Society of Washington from January 14 to March 10, 1904. A considerable number of entomological papers were read, some of which had an economic bearing and will be noted in this connection.

A brief synopsis of honey bees by W. H. Ashmead divides these insects into two genera, Megapis and Apis. The first genus includes only *M. dorsata* and *M. zonata*, while to the genus Apis 7 species are referred.

E. A. Schwarz describes a new coccinellid enemy of the San José scale. A new species of ladybug beetle is reported as occurring abundantly on fruit trees infested with San José scale and is efficient in controlling the scale. The species is described under the name of *Pseudoweisea suturalis.*

F. Benton discusses the specific name of the common honeybee, concluding that it should be *Apis mellifera* rather than *A. mellifica.*

Report of the entomologist, C. FRENCH (*Jour. Dept. Agr. Victoria, 2 (1903), No. 3, pp. 245–249*).—During the year under report the author carried on a number of experiments with grasshopper fungus, spraying for San José scale with lime-sulphur-salt wash, fumigation, and along other lines. Notes are also given on the inspection of orchards and nurseries and on injurious birds, of which the English starling appears to be the most important.

The cause and control of insect depredations, E. P. FELT (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 73–83*).—The author discusses the biological factors which are concerned in determining the prevalence of insect pests. In discussing general methods of controlling insects reference is made to clean culture, rotation of crops, the encouragement of natural enemies of insects, and the application of various insecticide treatments.

Insects injurious to plants, F. CORBOZ (*Chron. Agr. Canton Vaud, 17 (1904), No. 9, pp. 297–307, figs. 4*).—Attention is called to the desirability of protecting insectivorous birds on account of their help in controlling various insects. Brief notes are given on the depredations of *Melolontha vulgaris*, fruit-tree bark-beetle, and other insects injurious to trees.

Insects injurious to fruits in Michigan, R. H. PETTIT (*Michigan Sta. Spec. Bul. 24, pp. 79, figs. 70*).—This bulletin is issued as the first of a series on insects affecting various classes of crops. The habits, life history, and means of combating most common species of insects which affect different fruit trees are discussed in considerable detail. The insect pests are classified according to the fruit trees which they injure most, and according to the part of the tree or fruit affected.

Injurious insects of 1903, F. L. WASHBURN (*Minnesota Sta. Bul. 84, pp. VIII + 184, pl. 1, figs. 119*).—This has already been noted as the annual report of the author as State entomologist (E. S. R., 15, p. 784).

Orchard enemies, F. Horsfall (*Missouri Fruit Sta. Bul. 9, pp. 31, figs. 17*).—Notes on the habits, life history, and means of combating flat-headed apple-tree borer; round-headed apple-tree borer; giant root borer; peach-tree borer; fruit-bark beetle, codling moth; woolly aphis; apple-tree aphis; cankerworms; fall webworm; San José scale; tent caterpillars; plum curculio, etc. Brief notes are given on the methods of preparing approved insecticides.

Injurious insects, W. Lochhead (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 32, 33, fig. 1*).—Brief notes on the habits, life history, and means of combating pear psylla, Hessian fly, and codling moth. The pear psylla was unusually injurious during the past year, and special attention is given by the author to this insect. In combating the pest the author recommends spraying with kerosene emulsion, whale-oil soap, lime-sulphur wash, or crude petroleum.

Preliminary bulletin on insects of the cacao, C. S. Banks (*Philippine Dept. Int., Bureau Govt. Lab., 1903, No. 11, pp. 58, pls. 52*).—On account of the importance of the cacao crop in the Philippine Islands the author undertook an investigation of the insect pests of this plant. The present report is a result of this study and is to be considered as of a preliminary nature.

Notes are given which are believed to be useful for the farmers in the Philippines in identifying the various pests of cacao and in applying suitable remedies for controlling them. The chief insect pests of cacao in the Philippines appear to be black ants, cicadas, white grubs belonging to the genus Anomala, various borers in the trunks, white ants, a species of psocus, plant lice, thrips, various leaf-eating caterpillars, scale insects, and mealy bugs. A number of wasps and bugs as well as parasitic insects and spiders assist in controlling the injurious species. Notes are given on the injuries to cacao caused by rats and on insects injurious to dried cacao and some of the common fungus diseases.

On a plague of grasshoppers in the Central Provinces, S. Stockman (*Agr. Ledger, 190? No. 3* (*Ent. Ser., No. 10*), *pp. 55–85*).—The author investigated the habits, life history, and means of combating the grasshoppers which are commonly injurious to rice in India. It was found that the eggs were usually laid in damp, loose soil. The incubation period for the eggs was about 41 days. Young grasshoppers were not very seriously affected by heavy rains, but were susceptible to flooding, especially on muddy soil.

The author tested the South African locust fungus without any satisfactory results. A description is given of a trawling net useful for catching young locusts, and recommendations are made regarding methods of preventing the locusts, viz, rotation of crops, burning of grass, and other methods of preventing locust injuries.

The cotton-boll weevil, L. de la Barreda (*Com. Parasit. Agr.* [*Mexico*], *Circ. 6, pp. 35*).—An account is given of the habits, life history, and depredations of this pest, based in part upon publications of this Department. Experiments were conducted by the Mexican Commission of Agricultural Parasitology for the purpose of determining successful means of combating the pest. It is recommended that attention be given to the proper rotation of crops, careful selection of seed, flooding of the lands, and destruction of cotton plants in the fall.

The Mexican cotton-boll weevil in Texas, E. D. Sanderson (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 157–170, figs. 6*).—Already abstracted from another source (E. S. R., 15, p. 545).

A note on the root maggots, C. M. Weed (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 142, 143*).—During the season of 1903 the attacks of root maggots upon onions, cabbage, cauliflower, etc., was of unusual severity. Observations made for the purpose of determining the cause of this outbreak indicated that wild mustard and other related species serve as trap plants for the eggs of root maggots and that the prevalence of these pests is to some extent dependent upon the prevalence of the mustard family.

Coccidæ of Ohio, J. G. SANDERS (*Ohio State Univ. Bul., 8. ser., No. 17, pp. 25–92, pls. 9*).—Descriptive biological and economic notes are presented on all species of the subfamily Diaspinæ found in Ohio. In this subfamily 6 new species are described. A list is also given of the species of Coccinæ found in the State. An analytical key is presented for convenience in identifying the genera and species.

The San José scale in Japan, S. I. KUWANA ET AL. (*Imp. Agr. Expt. Sta., Japan, 1904, pp. 33, pls. 8*).—An elaborate study was carried out by the entomologists of the Imperial Agricultural Experiment Station of Japan for the purpose of determining the origin, distribution, and means of combating San José scale.

A description is presented of the horticultural conditions of Japan with especial reference to the bearing of these conditions upon the distribution of the scale. Notes are given on the prevalence of the San José scale in the various provinces of the Japanese empire. A long list of food plants is also presented. Contrary to supposition which has been made by various writers on the San José scale, this pest is not found in high, uncultivated regions of Japan nor upon native species of wild pear or apple. It is concluded as a result of these studies that the San José scale was introduced into Japan in 1871 on infested stock shipped to Awoyama. The pest has subsequently been distributed on trees sent all over the empire.

Low and comparatively moist regions appear to be favorable to the development of the San José scale. The natural enemies mentioned by the author are *Chilocorus similis* which is said, however, to prefer *Diaspis pentagona* and also the parasitic fungus (*Sphærostilbe coccophila*). It is stated that the Japanese have thus far not used power pumps in combating this insect nor has fumigation with gas been practiced. The best results have been obtained from the use of kerosene emulsion.

Injurious effects of the round-headed apple-tree borer, W. STUART (*Vermont Sta. Rpt. 1903, pp. 204–208*).—The round-headed apple-tree borer caused considerable damage during the year. Brief notes are given on the life history and habits of this insect, and on preventive and remedial measures which have been recommended.

Directions for spraying for the codling moth, C. W. WOODWORTH (*California Sta. Bul. 155, pp. 20, figs. 4*).—Of the various methods tested by the author in controlling codling moth the only one which has given encouraging results is the application of arsenical sprays. For this purpose the best substances are Paris green, arsenite of lime, and lead arsenate. Paris green gave as good results as any other arsenical, and in localities where it is apt to injure the foliage the author recommends that lime be added in quantities 5 to 10 times as great as the Paris green.

Lead arsenate proved to be the safest of all arsenicals, but was less effective than either Paris green or arsenite of lime in the destruction of the codling moth. A mixture of Paris green, oil, and lime was tested on a small scale, with good results. This mixture was prepared by stirring 1 lb. of Paris green into a pint of crude oil; 4 or 5 lbs. of lime were then slaked and the Paris green and oil added and stirred until the lime united with the excess of oil. The material was then diluted to 150 gal.

In spraying for the codling moth in California 3 applications appear to be necessary. The first should be made at the proper time for thoroughly poisoning the inside of the calyx lobes in order to destroy larvæ which may subsequently attempt to enter the apple at that place. The author maintains that it is useless in making this application to direct the spray anywhere except against the blossoms from above. The second application should be made at the time when the eggs are laid. At this time the spray should be applied to all parts of the leaves and fruit. The third application is considered the most important, and is directed against the larvæ of the second brood.

Coleoptera of the family Cerambycidæ, C. HOULBERT and E. MONNOT (*Faune Entomologique Armoricaine; (Coléoptères). Rennes: F. Simon, 1903, pp. 96, pl. 1,*

figs. 116).—In this report the author gives an account of the species of the family Cerambycidæ found in Armorica, with notes on their distribution.

Flour beetle (Tribolium confusum) (*Jour. Bd. Agr.* [*London*], *11* (*1904*), *No. 2, pp. 109, 110*).—The habits of this beetle are briefly noted. The most effective remedy in controlling it is bisulphid of carbon, and directions are given for applying this treatment.

A natural history of the British lepidoptera, IV, J. W. Tutt (*London: Swan, Sonnenschein & Co., 1904, pp. XVII+ 535, pls. 3*).—This constitutes a continuation of the author's elaborate monographic work on the British lepidoptera, and concludes the account of the superfamily Sphingides. The various observations made by the author concerning the life history of the species considered in the volume are recorded with the usual detail. In the preface the author discusses certain problems connected with the reform of the nomenclature of lepidoptera. The volume is provided with an index and also with a general index to the four volumes already published.

Experiments in 1893, 1894, and 1896 upon the color relation between lepidopterous larvæ and their surroundings, E. B. Poulton (*Trans. Ent. Soc. London, 1903, pt. 3, pp. 311–374, pls. 3*).—The author carried on an elaborate series of experiments to determine the relation between the color of insects and their environment, especially upon *Odontopera bidentata* and *Gastropacha quercifolia*. The behavior and color changes of the larvæ through their various stages are minutely described. It was found that the effect of dark surroundings upon the early stages was very marked. The influence of a dark environment even for one molting stage was manifested in a decided change of color.

The economic status of the Fulgoridæ, H. Osborn (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 32–36*).—Data are presented on the feeding habits and economic importance of these insects. It appears that thus far little work has been done along this line. Especial reference is made to the injurious attacks of *Liburnia campestris*, *L. lutulenta*, and cane leaf-hopper in Hawaii.

Notes on the nests of bees of the genus Trigona, C. O. Waterhouse (*Trans. Ent. Soc. London, 1903, pt. 1, pp. 133–136, pl. 1, figs. 3*).—The method of the construction of nests by this genus of bees is described in detail with notes on the differences observed in the nests of different species.

The suppression and control of the buffalo gnats in the valley of the lower Mississippi River, F. M. Webster (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 53–72, figs. 7*).—Previously noted from another source (E. S. R., 15, p. 545).

A new method of combating Atta sexdens and other ants injurious to cultivated plants, A. Hempel (*Bol. Agr. São Paulo, 5. ser., 1904, No. 2, pp. 72–74*).—Brief directions are given regarding the use of parasitic fungi in the control of injurious ants and other insect pests.

The spinning habits of the North American Attaci, F. M. Webster (*Canad. Ent., 36* (*1904*), *No. 5, pp. 133, 134*).—During the past 25 years the author has observed the position of the cocoons of *Samia cecropia* and related species. The downy woodpecker destroys the insects by puncturing the cocoons and feeding upon the contents. Some species of insects belonging to the group under discussion have apparently changed the location of the cocoons so that they are not so conspicuous, and thus avoid destruction by birds.

The nutrition of the bee moth, N. Sieber and S. Metalnikow (*Arch. Physiol.* [*Pflüger*], *102* (*1904*), *No. 5–6, pp. 269–286*).—The feeding habits of the bee moth were studied for the purpose of determining the actual materials eaten by this insect, and their relative nutritive importance. It was found during this study that beeswax must be considered as an important and necessary part of the diet of bee moth in order that this insect may thrive and multiply. Extracts were made from the digestive tract of the insect for the purpose of gaining more exact data concerning the digestive ferments in this pest.

Some observations on Antheræa yamamai and the methods of its rearing in Japan, C. Sasaki (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 43–50, pls. 2*).—Detailed notes are given on the habits, life history, and distribution of this moth. It appears that the artificial rearing of the insect is practiced only by the inhabitants of the village Ariakemura. The food plants of this moth are different species of oak.

A contribution to the life history of Orina tristis, T. A. Chapman (*Trans. Ent. Soc. London, 1903, pt. 3, pp. 245–261, pls. 2*).—A detailed account is given of the structure of the egg of this species with especial reference to a hatching of the larva. The habits of the adult insects are also described.

New observations on phthiriosis of grapes, L. Mangin and P. Viala (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 8, pp. 529–531*).—A continuation of the work already carried on by the authors with regard to the cause and nature of this disease indicates that the trouble is due to the attack of *Dactylopius vitis* which lives in symbiosis with the fungus *Bornetina corium.*

On the wax-producing coccid Ericerus pela, C. Sasaki (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 1–14, pls. 2*).—The literature relating to the production of wax by scale insects is critically discussed. Notes are given on the habits of *E. pela* with special reference to its wax-producing powers. The insect is considered to be a native of China and Japan. The food plants differ in the two countries. In Japan *Fraxinus pubinervis* is mentioned as one of the chief food plants of this scale insect. *F. chinensis* is an important food plant in China.

Note on the habits of Chironomus sordidellus, T. H. Taylor (*Trans. Ent. Soc. London, 1903, pt. 4, pp. 521–523, figs. 2*).—The habits of these aquatic larvæ are carefully described. In some cases it was observed that after pupation the six-legged larva of a water mite was found attached to the body of Chironomus. The parasite, however, appeared to have little injurious effect upon the host.

An experimental study of hydrocyanic-acid gas as an insecticide, F. López (*Bol. Sec. Fomento [Mexico], 3 (1904), No. 11, IV–VI, pp. 203–215*).—This gas was used in hospitals for the destruction of fleas, flies, mosquitoes, bedbugs, and other insects. The toxic effect of the gas for such purposes is found to be very great and satisfactory results were obtained in all experiments.

Lime-salt-sulphur wash (*Proc. New Jersey State Hort. Soc., 29 (1904), pp. 61–76, 249–251*).—The methods of preparing this wash and of applying it together with details regarding the effects of the wash upon various scale insects and upon the trees were discussed by J. B. Smith, W. G. Johnson, and others.

Spray calendar (*New York Cornell Sta. Bul. 217, pp. 125–133, fig. 1*).—In this calendar the most important points regarding sprays have been arranged for the convenience of reference and use by fruit growers. A number of fruits and garden vegetables are arranged in alphabetical order, the more important insect enemies and fungus diseases are noted under each crop with recommendations of the most effective remedial treatment.

Insecticides, R. Harcourt (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 43–45*).—Numerous samples of Paris green were analyzed for the purpose of determining the purity of the product and the relative insolubility of the arsenious acid. Considerable percentage of the samples was found to be adulterated. Analyses are also given of Black Death, potato bug finish, kno bug, slug shot, and Bug Death.

The common mosquitoes of New Jersey, J. B. Smith (*New Jersey Stas. Bul. 171, pp. 40, pls. 11, figs. 6*).—A detailed account is given of the habits, life history, and anatomical characters of the various species of mosquitoes found in New Jersey.

According to the author's investigations of this subject, 33 species of mosquitoes occur in the State. Attention is called to the economic aspects of the mosquito question, especially in regard to the agency of these insects in carrying malaria.

In combating mosquitoes the best results have been obtained from the use of hydrocyanic-acid gas, formalin, sulphur fumes, tobacco fumes, and pyrethrum in houses. Hydrocyanic-acid gas and formalin are preferable, since they are very effective and do not injure fabrics or other materials in houses.

Attention is called to the importance of draining salt marshes and other stagnant pools of water, as well as the use of kerosene films used in combating mosquitoes. A table is presented for the purpose of the identification of mosquitoes in New Jersey.

Apiculture, E. BERTRAND (*Conduite du rucher. Geneva: R. Burkhardt, 1904, 9. ed., pp. 288, pls. 3, figs. 82*).—In this edition the author presents in a revised and corrected form a general account of the subject of apiculture, including the details of management of bees, location of apiaries, marketing honey, etc.

Report of the lecturer on apiculture, H. R. ROWSOME (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 159, 160, figs. 2*).—Experiments were carried on for the purpose of determining the most successful method of storing honey for granulation. For this purpose a tank was constructed of wood held together by clamps. The outside of the tank was painted to prevent shrinking, and the inside was covered with paraffin. After the honey had granulated the sides were removed, when it was found that the whole mass, weighing one ton, was left in a solid cake. Notes are also given on various methods of hiving bees and other details of management.

Korean race of silkworms, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 21–26, pl. 1*).—In studying this race of silkworms the author observed that the fourth larval molt is omitted. The author believes that valuable races of silkworms may be obtained by improving certain promising varieties of the Korean race.

The beggar race of silkworms, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 27–31, figs. 4*).—While this race appears to feed greedily upon withered or otherwise spoiled, as well as fresh, mulberry leaves, the larvæ remain as vigorous as those of other races. Notes are given on the quality of raw silk produced by this race.

Double cocoon race of silkworms, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 33–35, figs. 8*).—The author has observed two varieties of this race, both of which spin yellowish cocoons. It is a vigorous race and easily reared by the native Japanese. The cocoons are almost all double, very large, and variable in shape. They usually inclose more than 2 chrysalids and sometimes as many as 8.

On the feeding of silkworms with the leaves of Cudrania triloba, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 15–19, pls. 2*).—Experiments have been carried on for a number of years, during which silkworms, especially the race known as *Awobiki*, were fed on the leaves of *C. triloba*. Detailed notes are given on the appearance of the insect during its various stages when fed on these leaves.

The results obtained from the author's investigations indicate that silkworms fed on this food pass through only four larval stages instead of five, but that the total larval period is about the same as when other materials are used for food. It was noted that if silkworms were fed exclusively on the leaves of *C. triloba* they appeared to be immune to the attacks of parasitic insects. The quality and quantity of filaments reeled from cocoons were good.

On the feeding of silkworms with the leaves of wild and cultivated mulberry trees, C. SASAKI (*Bul. Col. Agr., Tokyo Imp. Univ., 6 (1904), No. 1, pp. 37–41*).—As a result of a number of experiments in feeding silkworms the author concludes that silkworms require the same time for their growth, whether they are fed on wild or cultivated mulberry leaves. Those fed on the wild leaves are larger at each stage of growth than those fed on cultivated leaves. The weight and length of silkworms fed on wild leaves are greater than those fed on cultivated leaves. The

number of silkworms infested with the larvæ of *Ugimyia sericariæ* is larger when wild mulberry leaves are used as a food. The length of the filament and the quality of the silk are superior when the wild leaves are used.

FOODS—NUTRITION.

Glutenous and starchy wheats, H. SNYDER (*Minnesota Sta. Bul. 85, pp. 179–188, fig. 1*).—The characteristics of wheat kernels were studied with the object of determining the relation between the protein content and physical conditions. As regards light and heavy seeds, "there was a decided tendency for the light-weight seeds to contain the larger percentage of nitrogen, but because of the greater weight of the heavier seeds a much larger amount of total nitrogen was always found in a given number of them than in the same number of light-weight seeds.

"In the light and heavy weight seeds selected from 6 samples of wheat it was found that the light-weight seeds contained 16.17 per cent protein, while the heavy-weight starchy seeds contained 13.69 per cent, and the heavy-weight glutenous seeds 15.56 per cent.

"From these and other analyses it would appear that the light-weight and shrunken kernels are deficient in starch, but comparatively rich in total protein. Such seeds are known to produce a lower yield of flour and, not being well filled and perfect although nitrogenous in character, are not suitable either for the production of the best quality of flour or for selection for seed purposes."

When the nitrogen content of large and small but otherwise perfect kernels selected from the same samples of wheat was determined, it was found that the former contained on an average 13.50 per cent nitrogen and the latter 12.35 per cent.

The nitrogen content in relation to color was studied with 50 samples of hard and soft wheat gathered from a variety of sources, light and dark colored kernels being selected from each sample. The average protein content of the light-colored kernels was 12.68 per cent and of the dark-colored kernels 15.33 per cent. This question was further studied with samples of wheat grown "under the best conditions" from uniform seed sent out by the station. When the 2 sorts of seed, light and dark, were selected from the same lot of wheat the dark-colored seeds from all the samples analyzed were found to be richer in protein.

"Occasionally a sample of wheat is found which is so uniform in character that it is not possible to select from it 2 kinds of seeds, viz, light and dark ones. In the course of this examination one such sample was found. . . .

"The fact that the light-colored seeds are more starchy in character, while the amber ones are more glutenous, is valuable in the selection of seed wheat. In case it is desired to select seed which is glutenous, preference should be given to the medium-sized, heavy-weight, and dark-colored flinty kernels, as they contain a larger percentage of nitrogen than the lighter-colored kernels. The hand picking of glutenous kernels is possible in selecting seed for a small area. It is believed that such hand-selected seed would ultimately result in the production of wheat of high gluten content. . . .

"For human food purposes wheats with 18 per cent of protein mainly in the endosperm or floury portion are preferable to those of low protein content. Flours of high protein content require less reinforcement with expensive nitrogenous foods."

Composition and bread-making value of flour produced by the roller process of milling, H. SNYDER (*Minnesota Sta. Bul. 85, pp. 189–202, figs. 7*).—The composition and bread-making qualities were studied of different grades of flour and

milling products ground from the same lot of No. 1 Northern wheat of good quality, weighing 58 lbs. to the bushel. The chemical composition of the samples follows:

Composition of flour and milling products ground from the same lot of wheat.

Name of sample.	Water.	Protein (N×6.25).	Gliadin number.	Carbohydrates and fat.	Acidity.	Ash.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*
90 per cent patent	10.89	13.38	60.75	75.25	0.09	0.48
Clear grade	10.53	14.19	54.63	74.43	.13	.85
First break	11.68	13.56	60.83	74.15	.09	.61
Second break	11.10	15.00	59.17	73.38	.09	.52
Third break	10.97	16.50	59.09	72.04	.10	.49
Fourth break	11.14	18.44	58.31	69.71	.11	.71
First germ	10.90	12.00	54.17	76.62	.08	.48
Second germ	10.37	12.63	56.44	76.41	.10	.59
First middlings	10.37	12.63	57.43	76.57	.08	.42
Second middlings	10.69	13.31	63.85	75.58	.08	.42
Third middlings	10.29	12.56	66.67	76.78	.08	.37
Fourth middlings	11.08	12.25	64.29	76.29	.07	.38
Fifth middlings	10.21	12.81	62.44	76.55	.09	.42
Sixth middlings	10.15	12.94	57.97	76.53	.09	.37
Seventh middlings	10.30	13.31	59.16	79.92	.10	.47
First tailings	9.01	13.50	50.00	76.72	.12	.77
Second tailings	9.54	13.38	57.94	76.43	.10	.65
Second tailings cut	9.32	13.44	54.88	76.42	.11	.83
Shorts duster	9.36	15.19	39.51	73.84	.18	1.61
Shorts middlings	9.79	17.47	....	....	....	4.03
Wheat	13.07	14.25	....	....	....	1.82

As shown by technical and baking tests the dry gluten ranged from 12.60 per cent with the first germ to 20.35 per cent with the fourth break. The greatest expansive power of the gluten was found with the second middlings and the lowest with the first middlings.

The largest-sized loaf from a given quantity of flour was obtained with the 90 per cent patent and the smallest loaf with the shorts duster. "The fifth middlings flour produced the best quality of bread, both in texture and color. The second break flour produced the best bread of the break flours. Flours from the shorts duster and tailings produced poorer breads than did the middlings or break flours. . . . [In general it may be said] that the best quality of bread was produced from the middlings flour and that the largest-sized loaves were not made from the flours containing the largest amounts of gluten or protein. The quality of the gluten and the absence of impurities in the flour, as dust and débris particles, influenced the character and size of the loaf more than other factors."

The chemical composition of the whole wheat used in the above test and the wheat offals is shown in the following table:

Composition of wheat and the offals obtained from it.

	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Screenings	11.62	13.84	....	....	....	....
Scourings	9.09	11.63	2.44	....	....	3.40
Dust	8.77	11.25	3.85	70.62	....	5.51
Bran	12.35	14.37	4.93	52.96	9.58	5.81
Shorts	9.79	15.94	6.23	56.80	7.19	4.05
Wheat	13.07	14.22	2.20	....	....	1.83

The relative protein content of wheat and flour, H. SNYDER (*Minnesota Sta. Bul. 85, pp. 203–210*).—The relation between the protein content of wheat and the standard grades of flour and also the relation between the gliadin content of flour and the size of the loaf and commercial value of bread were studied. Composite sam-

ples of wheat and the principal flour products were selected for a period of a month on alternate days, from 3 large mills and analyzed, the wheat ground in every case being hard spring wheat. In general it may be said that the clear-grade flour "contained more protein than the original wheat. It has frequently been asserted that the bran and other offals contain the larger proportion of the proteid matter of the wheat kernel. These analyses of the wheat and of the flour milled from the same wheat show that this is not the case. The patent grades contain only slightly less protein than the wheat, while the lower grades contain somewhat more than the wheat itself. This suggests that, if it is desired to obtain flour of highest protein content, it can be found in the lower grades, as they contain more protein than the wheat itself. Such flours, however, produce a poorer quality of bread. [As regards] the comparative bread-making qualities of patent and clear-grade flours . . . it will be observed that the clear grades make smaller, darker loaves and a poorer quality of bread than the patent grades."

The gliaden content increased with the grade, the first patent flour showing the highest amount.

"The gliadin number is to some extent an index to the grade of the flour; the lower grades show a general tendency to contain less gliadin than the higher grades, although exceptions to this are noticeable. . . .

"While the gliadin number of the flour and the size of the loaf are not in all cases strictly in accord, there is a general relationship between the two; if a flour is abnormally low in gliadin it does not generally produce a large-sized loaf. The gliadin content of wheat and flour appears to be of more value in comparing the composition and characteristics of different types and varieties of wheat than in determining the quality or value for bread-making purposes of flour made from wheat of uniform character, such as was used in the investigations."

The acidity of the samples was also determined and is discussed in relation to gliadin, but definite conclusions are not reached. Among the author's general conclusions are the following:

"In this study of the protein content of wheat and of the various grades of flour it is manifest that the most nitrogenous flours are not always produced from wheats of the highest protein content. . . . The nitrogen may be variously distributed in different samples of wheat. . . . This is a matter of considerable importance in the selection of wheat for seed and milling and in the testing of varieties, because not all of the wheat kernel being used for human food purposes it is far more desirable to secure wheat with a large protein content in the endosperm than wheat with a large protein content in germ and bran. . . .

"The way in which the nitrogen is distributed in the wheat kernel is equally as important for bread making and human food purposes as is the total amount. It should be the aim to obtain wheat of high protein content in the endosperm rather than in the bran or germ; that is, an increase of protein in the floury portion of the kernel rather than in the offals. Furthermore, this protein should be of the best quality for bread-making purposes as well as large in amount."

Influence of storage and bleaching upon flours, H. Snyder (*Minnesota Sta. Bul. 85, pp. 213–217, figs. 2*).—The bread-making quality of samples of patent flour ground from both winter and spring wheat, stored for 4, 8, and 12 months in a dry, well-ventilated warehouse, was tested and compared with that of fresh flour ground from similar wheat. During storage the spring wheat flours lost from 1.86 to 2.21 per cent moisture, and the winter wheat flours somewhat less.

From analyses and baking tests it would appear, according to the author, that "when flour is milled from sound wheat there is no deterioration in bread-making value from storage when the flour is stored in a well-ventilated warehouse, a slight improvement in color and size of loaf being observed in the stored samples which, in part, was offset by the slight loss of absorption power. No effect upon the general

composition of the flours sufficient to influence the food value was noted. When flours are milled from unsound wheats, or contain débris particles of a fermentable nature, they possess poor keeping qualities, and such flours deteriorate in storage. In these tests a slight improvement resulted from storage of the sound flours. This is undoubtedly due to the action of the soluble ferments or enzyms which are known to be present in the wheat kernel. . . .

"In the storage of flour for family use, there is no danger of deterioration either in bread-making properties or food value provided sound flour is stored in a dry, well-ventilated room. Flour, however, readily absorbs undesirable odors, as from fresh pine wood, decaying vegetables, kerosene, and smoked meats."

The effect of bleaching upon the quality of flour was studied. Freshly generated oxygen was passed through the flour, which bleached readily. As shown by analyses, the bleaching did not materially change the percentage composition, but "it oxidized the coloring matter and had some influence upon the physical properties of the gluten."

As shown by bread-making experiments, "there appears to be no gain in bleaching purified flours made from a good quality of wheat, as the glutens were slightly oxidized, had lessened power of expansion and absorption, and the loaves from the bleached flours, although whiter in color, were smaller in size and less in weight."

The relative food value of graham, entire-wheat, and straight-grade flours, H. Snyder (*Minnesota Sta. Bul. 85, pp. 218–224*).—A summary of investigations noted from another publication (E. S. R., 15, p. 63).

The manufacture of macaroni, J. H. Shepard (*South Dakota Sta. Bul. 82, pp. 34–45, figs. 3*).—The manufacture of macaroni is described, the characteristics of a good product are pointed out, and recipes for cooking macaroni are given, together with methods of making bread from macaroni flour. According to the author the cooking quality and flavor of macaroni may be tested by boiling samples briskly for 15 minutes in slightly salted water.

"A good macaroni will be white in color and retain its shape. When eaten it will be tender and have a slightly sweetish taste, together with a peculiar nutty flavor, which is characteristic. A poor macaroni will have a starchy, unpleasant taste, and the flavor will be disagreeable. It may also be tough and leathery. If it has soured in curing the disagreeable flavor will betray the fact."

The food value of sugar, H. Snyder (*Minnesota Sta. Bul. 86, pp. 225–233, figs. 5*).—Two series of experiments were undertaken to study the nutritive value of sugar. In the first, the subjects (healthy workingmen) were given a mixed diet including sugar. In the second, the diet was the same except that sugar was omitted. With sugar 92.20 per cent of the protein, 96.08 per cent of the fat, and 95.96 per cent of the carbohydrates were digested, and 91.32 per cent of the energy was available. When sugar was omitted the values were as follows: Protein, 91.95; fat, 96.87; carbohydrates, 96.09, and energy, 89.34 per cent. In connection with the digestion experiments the balance of income and outgo of nitrogen was determined.

According to the author's calculations 98.9 per cent of the total energy of the sugar was available to the body.

"The addition of 5 oz. of sugar per day to the ration of workingmen proved beneficial. It increased the available energy of the ration 25 per cent and did not affect the digestibility of the other foods with which it was combined. The various nutrients were equally as digestible with as without the sugar.

"When sugar was added to the ration, the protein was more economically used, 25 per cent more nitrogen, one of the elements of protein, being retained in the body.

"The value of sugar in a ration depends upon its judicious use and combination with other foods."

The importance of some of the other articles consumed was also discussed. According to the author—

"Bread made from white flour supplied the largest amount of nutrients and at the least expense of any of the foods used in these digestion experiments.

"Milk exerted a beneficial action upon the digestibility of the foods with which it was combined, as the digestibility of these rations in which milk was present was found by experiment to be greater than the calculated digestibility.

"Without underestimating the value and importance of the protein in a ration, it is evident that the carbohydrates, as sugar and starch in flour and cereals, have a characteristic value, as they supply the body with more than half its total available energy."

The digestive action of milk, H. SNYDER (*Minnesota Sta. Bul. 86, pp. 234–237*).—Continuing earlier work (E. S. R., 14, p. 274), the influence of the enzyms or chemical ferments of milk upon the digestibility of the proteids of wheat was studied, samples of toasts being submitted to the action of fresh milk and milk 12 hours old under a variety of conditions.

According to the author—

"While the digestive action of milk upon the insoluble proteids of wheat is small, it is sufficient to render from 1 to 3 per cent of the total proteids soluble. The small amount of free acid in fresh milk has but little solvent action and alkaline salts in the proportion found in milk failed to dissolve any appreciable amount of proteids.

"In the presence of chloroform and ether, agents which retard the workings of organized ferments, the solvent action of the milk was not interrupted. From all of the facts, it would appear that the solvent action of fresh milk is due largely to the tryptic-like ferment or enzym which is a soluble ferment, and is a normal constituent of milk. These bodies enable milk to exert a slight digestive action. Under the conditions of these experiments from 1.5 to 3 per cent of the insoluble proteids of wheat, equivalent to from 4 to 12 per cent of the proteids in the milk used, were rendered soluble by these agents. There is a difference in the solvent action of milk; some milks have greater digestive power than others. When milk forms a part of a ration its digestive action undoubtedly adds to its dietetic value by rendering the foods with which it is combined more digestible."

The place of meat in the diet in Cologne, M. KÜHNAU (*Die Fleischkost im Kölner Haushalt. Cologne: Author, 1904; rev. in Ztschr. Fleisch- u. Milchhyg., 14 (1904), No. 8, p. 291*).—A summary of data designed for the use of housekeepers.

Composition of mushrooms, C. H. JONES (*Vermont Sta. Rpt. 1903, pp. 196, 197*).—Proximate and fertilizer analyses are reported of the following edible fungi: *Agaricus arvensis, A. rodmani, Boletus subluteus, Coprinus atramentarius, C. micaceus, C. squamosus, Lepiota naucinoides, Lycoperdon giganteum,* and *Marasmius oreades.* The ash varied within rather wide limits and was found to be rich in phosphates and potash, the latter, as a rule, predominating in 10 of the 12 samples analyzed.

"The analyses show, as has been pointed out by other observers, that mushrooms are particularly rich in water, the amount varying from nearly 89 to 95 per cent. Their chief value as food is derived from the nitrogenous matter present. . . .

"But little is known regarding the food value of the fiber and undetermined carbohydrates. The small amounts of pentosans present clearly indicate the practical absence of this important group.

"The variation in composition between samples of the same species, taken at different times and places, is quite marked and may indicate that the age of the specimen and the nature and abundance of the plant food present in the soil during the growth have an important influence."

Analyses of infant foods, C. H. JONES (*Vermont Sta. Rpt. 1903, pp. 197, 198*).—Analyses of 6 infant foods are reported. Lactose, maltose, starch, dextrin, and sucrose were determined in addition to the usual constituents.

The food production of British farms, R. H. Rew (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 110–122*).—Statistics regarding the production of vegetable and animal food products on British farms are summarized and discussed.

Borax and boric acid as drugs and preservatives (*Borax und Borsäure als Arznei- und Konservierungsmittel. Nuremberg: Bund Deutscher Nahrungsmittel- Fabrikanten- und Händler, 1903; rev. in Ztschr. Fleisch- u. Milchhyg., 14 (1904), No. 8, p. 291*).—A summary of data regarding borax and boric acid. The general conclusion was drawn that these substances have not been shown to be harmful when used as food preservatives.

Anilin dyes, G. W. Chlopin (*Kamennougolnuiya Kraski. Dorpat: K. Mattisen, 1903, pp. 300*).—The author reports the results of an elaborate study upon the composition and effects upon animal life of various dyestuffs made from coal-tar products. The different dyestuffs are classified according to their chemical relationship and notes are given on the characters of the various groups.

Numerous experiments were made in testing the effect of anilin dyes in food products upon the animal organism. It was found that a considerable variety of these dyes were harmful. The majority of poisonous dyestuffs belong to the nitro, azo, and triphenyl groups. While these groups are mentioned as especially poisonous, the author maintains the general proposition that all anilin dyes are more or less injurious to the animal organism and that their use in food products should be prohibited by law. (See E. S. R., 15, p. 494.)

A new type of anemo-calorimeter for clinical uses, A. O. Ignatowski (*Arch. Physiol. [Pflüger], 102 (1904), No. 5–6, pp. 217–248, figs. 3*).—In the apparatus described the temperature is measured by the speed of a small windmill driven by the escape from the calorimeter chamber of air warmed by the patient's body. The apparatus is of such a size that it may be placed over a cot.

Concerning the artificial transformation of albumin into globulin, L. Moll (*Hofmeister's Beitr., 4, No. 12, p. 563; abs. in Zentbl. Physiol., 18 (1904), No. 2, pp. 41, 42*).—Blood serum warmed for an hour at 60°, when diluted with water and acidulated with dilute acetic acid, gave a much larger precipitate than untreated blood serum and was found to contain an increased amount of globulin and alkali albuminate. The effect of lower temperature was also studied, and experiments are reported on crystallized serum albumin and its behavior toward a number of reagents.

In general, it was found that the globulin formed depended upon the concentration of the albumin solution, increasing with the increased concentration. Carbonates, bicarbonates, and phosphates of the alkali metals had an equally marked effect; the hydroxids, the least marked.

The cleavage of gelatin, II and III, P. A. Levene (*Ztschr. Physiol. Chem., 41 (1904), No. 1–2, pp. 8–14, 99, 100*).—Products obtained from gelatin by ferment action were studied, in continuation of earlier work (E. S. R., 14, p. 992).

Concerning ferments in organs which induce cleavage in sugar, J. Feinschmidt (*Hofmeister's Beitr., 4, No. 9–11, p. 511; abs. in Zentbl. Physiol., 18 (1904), No. 2, pp. 49, 50*).—The glycolytic power of different organs of several animals was studied.

Concerning the coagulating effect of autolytic organ extracts on albumose solutions and on milk, A. Nürnberg (*Hofmeister's Beitr., 4, No. 12, p. 543; abs. in Zentbl. Physiol., 18 (1904), No. 2, p. 43*).—The effect on albumose solutions and milk of the extracts of various organs submitted to self-digestion was studied.

On the adaptation of the pancreas, F. A. Bainbridge (*Jour. Physiol., 31 (1904), No. 2, pp. 98–119*).—A number of experiments with dogs are reported. Among the conclusions drawn were the following:

"The pancreas of adult dogs normally contains no lactase, although this enzym is present in extracts of the intestinal mucous membrane of such dogs; yet when dogs

are fed for two or more weeks on a milk diet, their pancreatic juice obtained by means of secretin invariably contains lactase.

"The formation of lactase by the pancreas is a specific reaction to lactose; it occurs only when lactose is given by the mouth, and not when it is injected subcutaneously. . . .

"The lactase of the pancreas is in no way derived from that present in the intestinal mucosa; it is formed by the pancreas itself, and represents a definite adaptation to a milk diet on the part of the pancreas. . . .

"Secretin appears to have a definite composition, is in no way modified by difference of diet, and is not concerned in the adaptation of the pancreas to food; it calls forth the secretion by the pancreas of all the enzyms present in the gland at the time."

Estimation of carbon dioxid by densimetry, A. D. Waller and B. J. Collingwood (*Jour. Physiol., 30 (1904), No. 5–6, Proc. Physiol. Soc., 1903, pp. XXXVI–XXXIX, fig. 1*).—A method of estimating carbon dioxid with a form of densimeter is described.

Note on the calculation of the respiratory quotient from volumetric data, A. D. Waller and B. J. Collingwood (*Jour. Physiol., 30 (1904), No. 5–6, Proc. Physiol. Soc., 1903, pp. XXXIX–XLII*).—The factors which should be taken into account in determining the true respiratory quotient are discussed, as well as the possible sources of error. On the basis of results obtained with the densimeter, the authors assert the theoretical possibility of experimentally estimating the respiratory quotient without volumetric determination of oxygen.

ANIMAL PRODUCTION.

Experiments with fattening steers, M. Cumming (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 84–87*).—Continuing earlier work (E. S. R., 15, p. 67), a test was conducted to determine whether in fattening steers it is more satisfactory to buy moderately heavy animals and feed them for a short period, or lighter, thinner animals, and continue the feeding for a longer period. Eight steers weighing on an average 1,271 lbs. and fed for 117 days, made an average daily gain of 2.08 lbs. at a cost of 12.75 cts. per pound, as compared with 2.16 lbs. daily gain at a cost of 10.53 cts. made by an equal number of steers averaging 1,098 lbs. in weight and fed for 160 days.

"Every pound of gain in live weight costs more to produce than it will sell for on the market. Any profit in feeding must come from increasing the value of the carcass purchased in the beginning. Therefore, the steer which requires to be increased in weight only 200 lbs. in order to be fit for market, is worth considerably more per pound than the steer which requires to be increased 300 lbs."

In order to learn the relative merits of cut and uncut hay and roots in the above tests one-half the steers were fed these feeding stuffs cut and the other half whole. The average daily gain on cut feed was 2.04 lbs., as compared with 2.16 lbs. on uncut feed, the cost of a pound of gain in the 2 cases being 10.82 and 11.54 cts., respectively. A little less meal and a little more hay and roots were consumed per pound of gain when the feed was not cut. According to the author, it will depend upon circumstances whether the slightly lower cost of a pound of gain is sufficient to pay for the labor of cutting the hay and pulping the roots.

The value of blood meal as part of the ration for steers was studied; a lot of 8 animals averaging 1,250 lbs. in weight being fed 1.20 lbs. of this material per day for 63 days in addition to corn meal, oats, and barley. The total gain made by the lot was 1,085 lbs. as compared with 1,070 lbs. made by a similar lot of 8 steers fed the same basal ration but no blood meal. With the former lot 4.29 lbs. meal and 0.54 lb.

blood meal were required per pound of gain and with the latter lot 4.43 lbs. meal with practically the same amounts of hay and roots in addition in each case. The gains were more expensive with the blood meal than without it.

"This is scarcely a fair test for blood meal as a food for cattle, as its greatest value no doubt is with the young, growing cattle that need protein for developing muscle. Moreover, the results are in accord with our previous experiments, which have gone to show that light meal rations are more economical than heavier meal rations."

The possible profits in feeding range steers was studied with 9 such animals, the test covering 147 days, during a part of which time the steers were allowed the run of a small yard. The average weight at the beginning of the test was 980 lbs., the average daily gain 1.53 lbs., the cost of a pound of gain 15.56 cts., and the food consumed per pound of gain 5.42 lbs. grain, 27.5 lbs. roots, and 18.5 lbs. hay.

"So far as this experiment is concerned, it is evident that unless they could be bought at a very low rate it would not pay to feed such steers as those experimented upon. At the same time it is worth noting that these steers made much better gains during the period they were allowed the run of a yard than when they were confined in their pens."

The feeding value of soft corn for beef production, W. J. KENNEDY ET AL. (*Iowa Sta. Bul. 75, pp. 117-133*).—The corn crop was seriously damaged in many sections of the United States in 1902 by early frosts, the yield per acre being much reduced and the corn worthless from a market standpoint, since it was soft and watery. With a view to learning the real value of this crop, the station studied the feeding value and chemical composition of such corn.

After a preliminary period, in which corn fodder and shredded corn were compared for supplementing pasturage, the test began August 11 with 2 lots of 8 steers each, averaging 1,030 lbs. per head in weight. From the first the steers were fed full grain rations, in one case soft corn, and in the other mature corn, the grain ration being supplemented by pasturage and later by hay and gluten feed. At the close of the test, April 13, the steers were sold in Chicago and slaughtered. The steers fed soft corn required 9.77 lbs. of corn with 3.9 lbs. of hay per pound of gain and those fed mature corn 9.36 lbs. of corn and 3.44 lbs. of hay, the cost of a pound of gain in the two cases being 7.92 cts. and 10.95 cts. The shrinkage in shipping the soft corn fed lot was 3.38 per cent and the dressed weight 60.8 per cent of the live weight. Similar values for the lot fed mature corn were 3.47 per cent and 60 per cent.

The soft corn used in the above trial contained a little over 35 per cent moisture at the beginning of the test and 16 per cent at its close. According to the authors the results obtained show that the soft corn was fully equal in feeding value to mature corn for fattening cattle.

"Cattle fed on such soft corn made nearly as heavy gains and finished equally as well as those fed on mature corn. . . . When soft corn similar to that used in this test could be purchased for 30 cts. per bushel, the prevailing market price, gains on fattening cattle could be made at a cost of 3.03 cts. per pound less than when mature corn, costing 50 cts. per bushel, the prevailing market price, was fed under similar conditions."

Analyses showed that both the grain and cob of soft corn contained considerably more water than similar samples of mature corn, but did not differ otherwise markedly in chemical composition. In a considerable number of analyses of samples of corn gathered from different sections of Iowa in 1902 the maximum amount of moisture present in the corn was 23.89 per cent, the minimum 11.30 per cent, and the average 18.83 per cent. In the case of the cob the maximum was 39 per cent, the minimum 6.76 per cent, and the average 27.65 per cent. As shown by these figures the variation in water content was large. According to the authors "the amount of moisture depends chiefly upon the maturity of the corn when stricken by frost.

"That the [soft] corn was affected by the frost and of a chaffy nature is noticeable when the weight of a measured bushel is taken. An average of several tests made to determine the weight per measured bushel showed it to be but 51 lbs."

Corn dries when stored, and a test was made of the amount of moisture lost by 4 varieties in 9 months from the time it was husked and cribbed. The total loss of water varied from 21.09 per cent of the amount originally present with Iowa Silver Mine to 22.05 per cent with Mammoth Red.

Cocoa-shell milk for calves, H. H. DEAN (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 73, 74*).—Two calves fed daily in addition to some grain and green feed, 1.5 to 2 gal. of a decoction of cocoa shells made by boiling 0.25 lb. of the shells in 2 gal. of water, gained 135 lbs. in 8 weeks. Under similar circumstances 2 calves fed 1.5 to 2 gal. of skim milk per day in addition to other feeds gained 148 lbs. in 8 weeks. The cocoa-shell decoction (cocoa-shell milk) when fed with grain and green feed "appears to be a very good substitute for skim milk and is worthy of a trial by those farmers who wish to rear calves and have little or no skim milk to feed. However, there is probably no substitute which will entirely take the place of milk for young stock."

Profitable stock feeding, H. P. SMITH (*Breeder's Gaz., 45 (1904), No. 20, pp. 945, 946, figs. 5*).—The value on the block of beef carcasses of different types is discussed with special reference to different factors as a means of judging of the quality of the meat.

Experiments with swine, M. CUMMING (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 81–84*).—The value of blood meal and tankage as compared with skim milk was tested with 7 lots of 5 pigs each, those in 5 of the lots averaging 33 lbs. in weight and those in the remaining 2 lots 21 lbs. each. The blood meal and tankage used were obtained in Chicago and were designed especially for use as feeding stuffs. These by-products, with and without skim milk, were added to a basal ration of grain (at first middlings and later barley) and compared with a similar ration of grain and skim milk 1 to 2. The light-weight pigs were fed the packing-house by-products in the proportion of about 1 lb. to 18 lbs. of grain, and the heavy pigs in the proportion of about 1 to 13. When fed with skim milk, the proportion of packing-house by-products was one-half as large as in the case of the light-weight pigs. In the 137 days of the test the total gain of the lot on blood meal and grain was 817 lbs., that of the 2 lots fed tankage and grain 790 and 716 lbs., of the lots fed skim milk and grain 712 and 744 lbs., and of the lots fed blood meal and tankage with skim milk and grain 695 and 800 lbs., respectively. The cost of a pound of gain ranged from 4.08 cts. with one of the lots fed tankage and grain to 5.4 cts. with one of the lots fed skim milk and grain and was in general higher with the lots fed skim milk than with the others. The grain consumed per pound of gain ranged from 3.53 lbs. with the lot fed grain and blood meal to 4.59 lbs. with one of the lots fed skim milk and grain. Among the author's conclusions were the following:

"The pigs, without exception, took to the blood meal and tankage from the very first with great avidity. There is nothing in this experiment to indicate which is the more valuable food, blood meal or tankage. In both cases where light-weight pigs were fed in comparison with heavier pigs, cheaper gains were made by the former.

"Blood meal and tankage have proven themselves fully equal to skim milk for the production of firm bacon, and, so far as this experiment is concerned, have produced cheaper gains.

"This is but a single experiment, and will have to be repeated several times before any reliable results can be announced."

In the above test the author notes that a little green feed was given the pigs each day and "seems to have been most beneficial."

In a second test the attempt was made to feed an ordinary commercial blood meal of Canadian manufacture, not especially prepared as a feeding stuff, 2 lots of 5 pigs each being selected for the purpose. From the first the pigs showed aversion to this food and after 3 weeks it was dropped. When the pigs had recovered their normal condition 9 of them were fed a ration of grain and skim milk 3 times a day to learn something of the comparative merits of frequent feeding.

In 101 days the total gain was 1,224 lbs., the cost of a pound of gain 5.21 cts., and the feed eaten per pound of gain 4.31 lbs. meal and 9.06 lbs. skim milk. These pigs made somewhat greater gains than the lots in the above-mentioned test with which the author considers they are directly comparable, yet, in his opinion, "the extra gain was not sufficient to pay for the extra labor of feeding." . . . From this experiment it is evident that where gains alone, irrespective of cost, are aimed at, as in the case of some "show stock," feeding 3 times a day or possibly more is good practice.

Poultry management, F. B. LINFIELD (*Montana Sta. Bul. 50, pp. 180–190, figs. 3*).—Poultry houses, poultry feeding, and other general topics are discussed with special reference to local conditions.

Killing and plucking poultry (*Mark Lane Express, 90 (1904), No. 3788, pp. 521, 522*).—A summary of data with special reference to the requirements of the English market.

Poultry management at the Maine Agricultural Experiment Station, G. M. GOWELL (*Maine Sta. Bul. 100, pp. 20, pls. 6*).—Data regarding methods of incubation, treatment, and housing of young chicks, and of feeding laying hens are summarized, the discussion being based on the station's experiments with poultry feeding which have extended over a number of years. Descriptions are also included of warmed and curtained-front poultry houses, and the trap nests devised by the station. Although natural incubation is not the preferable method at the station, it is stated that it has been satisfactorily practiced. Nesting boxes, closed with a door of slats and containing a nest with sufficient space in front so that the hen may stand without breaking the eggs, were found satisfactory.

"For the accommodation of the hen with her brood of young chicks, the best arrangement consists of a close coop about 30 in. square, with a hinged roof, and a movable floor in two parts, which can be lifted out each day for cleaning. This little coop has a wire-covered yard attached to it on the south side. The yard is 4 by 5 ft. in size and a foot and a half high."

After a few weeks the chicks need a larger run and the netting can be raised so that they can pass in and out at will.

The use of incubators and brooders has proved very satisfactory. In the case of brooders the greatest difficulty experienced was due to the lamps used as "the tendency is for the oil to become warm and form gases, which causes the flame to stream up." It is suggested that this difficulty may be avoided by using an improved lamp.

When about 100 days old the chickens are moved from the brooders to the fields and the cockrels and pullets are separated and the latter confined in yards in lots of about 100. They are fed twice daily a porridge made of corn meal, middlings, or flour, and fine beef scrap 4:2:1 wet with skim milk or water until the mixture will run but not drop from the end of a wooden spoon. They are fed this mixture in the morning and again toward evening and are given plenty of shade and kept as quiet as possible. Four weeks has been found to be the limit of profitable feeding. Such special feeding is considered profitable as is also the practice of marketing chickens dressed.

"The quality of the well-covered, soft-fleshed chickens, if not too fat, is so much superior to the same birds not specially prepared, that they will be sought for at the higher price. The dairy farmer is particularly well prepared to carry on this work, as he has the skim milk which is of great importance in obtaining yield and quality of flesh."

It is stated that the warmed poultry houses used at the station have given very satisfactory results, as have the poultry houses with a roosting closet closed in front at night with a curtain of oiled cotton and having a scratching room exposed to the sun and air, the floor being covered with clean straw.

On the basis of 21 years' work with the same family of Barred Plymouth Rocks the station has decided upon a method of feeding which is considered satisfactory. Each pen of 22 birds is given a pint of wheat scattered in the litter in the morning and at 9.30 a. m. one-half pint of oats. At 1 p. m. one-half pint of cracked corn is fed in the same way. At 3 p. m. in winter and 4 p. m. in summer they are fed all they will eat in a half hour of a mash made of 2 parts of wheat bran and 1 each of corn meal, wheat middlings, linseed meal, gluten meal, and beef scrap. With this is mixed clover heads and leaves equivalent in bulk to one-fourth of the mash.

"The clover is covered with hot water and allowed to stand for three or four hours. The mash is made quite dry, and rubbed down with the shovel in mixing, so that the pieces of clover are separated and covered with the meal. Cracked bone, oyster shell, clean grit, and water are before them all of the time. Two large mangolds are fed to the birds in each pen daily in winter. They are stuck onto large nails which are partly driven into the wall, a foot and a half above the floor. Very few soft-shelled eggs are laid and, so far as known, not an egg has been eaten by the hens during the last five years."

Report of manager of the poultry department, W. R. GRAHAM (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 152-158*).—The general condition of the poultry department and the success which has attended hatching eggs in different ways are briefly spoken of, and a number of experiments are reported. The fact that Andalusian fowls do not hatch true to color is noted and briefly discussed.

As regards the influence of the position of eggs in incubator trays a trial indicated "that eggs for incubation should lie in the natural way, that is, on their sides. Some incubator operators are not particular about this in the management of their machines, and the result is a considerable number of chickens dead in the shell, which is especially noticeable in eggs placed with the small end up."

The effect of introducing oxygen into the hatching chamber was also studied. In the first test it was observed that on the eighth day of incubation some of the eggs showed what is known as the "blood ring," that is, a ring of blood encircling the embryo. "The oxygen appeared to be too much of a stimulant, causing abnormal growth of the germ, which often resulted in the rupturing of the blood vessels of the germ." From 89 fertile eggs only 27 chicks were hatched, while in an incubator managed in the ordinary way 44 chickens were hatched from 94 fertile eggs. Practically all of these chickens were raised, killed, and sold in the ordinary way, while those hatched in an incubator supplied with oxygen, with one or two exceptions, died, many of them during the first 10 days after hatching, though placed in the same brooder and fed in the same way as the others. Two later trials with smaller amounts of oxygen though not as unsatisfactory as the first trial were "characterized by smaller hatches and poorer chicks than were obtained from machines run in the ordinary way."

The egg production of fowls kept in a cool airy house was tested throughout a period extending from December to October. The house was not warmly built and one of the small windows in the front of it was left partly open and covered with a piece of cotton tacked over it during the winter. The lowest recorded temperature was 9° above zero, which it is stated was exceptional, but 15 to 24° above was very common. In addition to a number of cockerels the flock comprised 18 hens at the beginning and 6 at the end of the test, one having died and a number having been sold. The total number of eggs produced was 1,763. The value of the eggs sold at current prices was $23.33. This sum does not include $3 worth of eggs which were incubated. An account was kept of the feed consumed, and the author calculates

that when all were sold this lot of poultry yielded a profit of $11.88. As regards the effect of this system on different breeds the author states that less satisfactory results were obtained with Leghorns, Minorcas, and similar breeds, than with Wyandottes, Orpingtons, etc., the lighter birds feeling the cold much more than the heavier.

The system of not allowing yearling hens intended for breeders to lay during the winter was tested to some extent, and the results obtained were considered favorable.

Using 16 lots of 12 chickens each, the relative value of skim milk, tankage, blood meal, animal meal, and beef scrap supplementing grain (ground oats, ground buckwheat, and corn meal 2:2:1) was studied and also the value of a ration of potatoes, shorts, and skim milk. In nearly every case the rations were fed to lots in crates and lots in pens to compare the merits of the 2 systems of feeding. On an average the chickens weighed from 3 to 5 lbs. and in the 2 weeks of the trial the gain per lot ranged from 9 lbs. on a ration of potatoes, shorts, and skim milk to 18 lbs. on a ration of grain, skim milk, and animal meal. Considering the test as a whole, the average gain made by the chickens fed skim milk and grain was 14.8 lbs., of those fed packing-house by-products 14.1 lbs., and of those fed a potato ration 9.7 lbs. The cost of feed per pound of gain ranged from 3.4 cts. with one of the lots fed grain and skim milk to 6.2 cts. with one of the lots fed grain and blood meal. This latter lot required the greatest amount of grain per pound of gain, namely, 3.45 lbs. The smallest quantity, 2.2 lbs., was required with one of the lots fed grain and tankage. Of the different substitutes for skim milk tested the author considered digester tankage and animal meal the most satisfactory.

"Blood meal did not give nearly so good returns; and furthermore, these rations were not relished by the chickens. Beef scrap gave very good returns; but at sixty to seventy dollars per ton, it is too expensive. The feeding of both animal meal and skim milk does not appear to have any particular advantage over the feeding of either one singly with the grain ration.

"The potato and shorts [and skim milk] ration is only a fair one, but no doubt would be very convenient for many farmers; and, where the market demands a half-fat chicken, this ration is worthy of consideration.

"The crate-fed birds made a pound of gain cheaper than the birds fed in pens; but if we deduct the second trial in crate feeding, then the cost of a pound of gain is about equal. The chickens fed on the potato ration did better in the pens. . . . [Good chickens], weighing a little more than 3 lbs. each, are more profitable feeders than larger birds."

The relative profits of marketing ducks when first feathered as compared with holding them until later was studied with a flock composed of 51 Pekins, Rouens and Pekin and Indian Runner crosses. When 9 weeks old the ducks weighed on an average 5.1 lbs. They were in good feather and ready for market; however, only 6 were killed. At the end of the next week the 45 ducks remaining had lost 7 lbs. in weight as they were beginning to moult heavily. All but 13 were killed and sold. In dressing they lost 0.75 lb. in weight per pair. "The necks were pulled in the same manner as the chickens are killed. Had the ducks been bled, no doubt there would have been a greater shrinkage." Deducting the price of the feed consumed the author calculates that there was a profit of 34 cts. on each duck, and if they had all been marketed when 9 weeks old the profit would have been 38 cts. The remaining 13 ducks were fed a week longer and gained 2 lbs. in weight, consuming 27 lbs. of grain and a like amount of skim milk.

"There was not much gain made by the ducks until after the new feathers had been fairly well grown. In fact, the cost of the feed eaten each week after the ninth amounted to more than the price of pounds of gain made during the week.

"From this trial it is very evident that when ducks become well feathered, that this is the most profitable time to sell them; and, secondly, that the growth made

after the ninth or tenth week will seldom leave any margin of profit, after deducting the cost of feed."

As regards breeds, the Pekins and Indian Runner Pekins matured the fastest. "They were ready to kill fully one week in advance of the Rouens."

Digestion experiments with poultry, E. W. Brown (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 56, pp. 112, pls. 4, charts 2*).—The digestibility of corn, oats, wheat, and meat was studied with hens, the feces being collected with the aid of a specially constructed aluminium pan attached to the birds by straps. The feces were preserved for analysis by covering them with 95 per cent alcohol slightly acidulated with acetic acid to prevent the loss of ammonia. Full analyses of the feed and feces were made.

In addition to the usual determinations the ammonia, metabolic products, uric acid, pentosans, soluble ash, and silica in the feces were determined. The estimation of the uric acid is of special importance in experiments with poultry, as this represents the bulk of the urine nitrogen. It was determined by a modification of Kionka's method[a] by titration with piperidine, using phenolphthalein as an indicator. Sixteen experiments of from 6 to 13 days' duration are reported, in each of which the feeding stuffs selected were fed alone during the experimental period and during a preliminary period of 5 to 8 days. The following table summarizes the coefficients of digestibility obtained:

Coefficients of digestibility of a number of feeding stuffs—Experiments with hens.

	Organic matter.	Protein.	Ether extract.	Crude fiber.	Nitrogen-free extract.	Pentosans.
Corn, average of 5 tests	86.64	83.95	85.32	[b]14.53	89.25	[c]30.05
Oats, average of 8 tests	64.77	73.38	81.48	[b]8.15	70.77	[d]16.80
Wheat, 1 test	83.94	77.40	58.83	....	86.02	....
Beef, average of 2 tests	87.05	90.20	86.30	....	....	....

[b] Not regarded by author as reliable.
[c] Average of 3 tests.
[d] Average of 7 tests.

On the basis of the amounts of food consumed and digested the following feeding standards were calculated, which the author regards as provisional:

Feeding standards for hens.

[Amounts per day per 100 lbs. live weight.]

	Organic matter.	Protein.	Ether extract.	Nitrogen-free extract.	Fuel value.	Nutritive ratio.
AMOUNTS CONSUMED.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Calories.*	
Hens (3 to 4 pounds), corn	4.83	0.53	0.28	3.89	100,732	1 : 8.6
Hens (3 to 4 pounds), oats	2.84	.37	.15	1.97	54,065	1 : 6.3
Hens (3 to 4 pounds), wheat	3.27	.42	.07	2.72	66,259	1 : 6.9
AMOUNTS ASSIMILATED.						
Hens (3 to 4 pounds), corn	4.19	.45	.24	3.46	88,623	1 : 9.0
Hens (3 to 4 pounds), oats	1.83	.28	.12	1.39	39,438	1 : 6.0
Hens (3 to 4 pounds), wheat	2.70	.32	.04	2.42	56,681	1 : 7.8

[a] Arch. Internat. Pharmacodynamie, 7 (1900), p. 55.

The cost of a pound of nutrients supplied by the different grains is calculated as follows:

Cost of 1 pound of digested nutrients supplied by the different grains.

Kind of grain.	Cost of 1 pound of—			
	Organic matter.	Protein.	Ether extract.	Nitrogen-free extract.
	Cents.	*Cents.*	*Cents.*	*Cents.*
Corn	1.41	1.44	1.46	1.39
Oats	2.32	2.17	1.93	2.25
Wheat	1.78	1.96	2.55	1.76

In connection with the experiments the daily weight of the chickens was recorded, and a number of interesting calculations were made, experimental data and methods in every case being reported and discussed in full, the numerous references to the literature cited constituting an extended bibliography.

The provisional conclusions arrived at were in effect as follows:

Corn, oats, and wheat show marked differences in the digestibility of several of their respective nutrients. The protein and nitrogen-free extract are assimilated in much greater proportion in corn than in oats. The digestion coefficient for the protein of wheat is intermediate in value between the average results for these 2 grains.

The digestibility of the fat of corn is slightly greater than that of oats. The digestibility of the fat of wheat is conspicuously less than that of corn and oats. This fact may at least in part account for the untoward results of a diet of wheat only.

Chickens consume a much greater quantity of corn than oats—an important fact to be kept in mind in a comparison of the digestion coefficients of the 2 grains. The nutritive superiority of corn over oats is indicated by the body weight. An increase is manifested under the use of corn, while a tendency in the opposite direction is seen with oats. The nutrients of corn are fed at a lower cost than those of oats and wheat. The last-named grain is the most costly of the 3 foods. This conclusion is based on the actual digestibility of the various nutrients of the grains.

Regarding the application of these grains in mixed dietaries the following suggestions are offered: Corn may be included for the main nutrients—that is, protein, nitrogen-free extract, and ether extract. Oats may be utilized for the protein and ether extract. Wheat may be employed for the protein and nitrogen-free extract, but adequate provision must be made for the deficient yield of this grain in fat.

The protein and fat of beef show high coefficients of digestibility, the former is considerably higher, the latter but slightly less than the corresponding nutrients in corn.

Composition of by-products of flour, oat, pea, and starch mills, W. P. GAMBLE (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 51–54*).—A brief account of investigations which have been undertaken to learn the composition of by-products used as feeding stuffs.

Annual report for 1903 of the consulting chemist, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 286–295*).—Analyses of a number of feeding stuffs and fertilizers are reported.

DAIRY FARMING—DAIRYING.

Feeding trials with cows, J. L. Hills (*Vermont Sta. Rpt. 1903, pp. 209–264+XXXIV*).—This is a detailed account of feeding experiments conducted during the year along the same general line followed during the previous 5 years. Many of the experiments are repetitions of those reported last year. Tests were made to compare low and medium grain rations; to ascertain the extent of experimental error in feeding trials; and to study the feeding value of distillers' grains, brewers' grains, cotton-seed meal, linseed meal, apple pomace, pumpkins, and a proprietary dairy feed. As in previous years, the detailed data are given in the form of an appendix. The trials included 48 cows and lasted 25 weeks. Each feeding trial lasted 5 weeks, the conclusions in every case being based upon the data obtained during the last 23 days.

Grain rations of 2, 4, and 8 lbs. were compared with 12 cows, the results showing an increase in the yield of milk and fat of 10 per cent when the 2-lb. ration was replaced by the 4-lb. ration, and of 18 per cent when replaced by the 8-lb. ration. It is estimated that when 2 lbs. of grain was fed instead of 4, the saving in cost of feed was $3.32 and the loss in butter not made was $3.74; and that when 2 lbs. of grain was fed instead of 8, the saving in cost of feed was $8.40 and the loss in butter not made was $6.42. The 4-lb. ration was considered more satisfactory in every way than the 2-lb. ration. While the yield of butter from the 8-lb. ration did not pay the extra cost of grain as compared with the 4-lb. ration, yet the heavier ration was considered the more satisfactory when the skim milk and manure are taken into account.

Four cows were used in a test to determine the value of feeding dried distillers' grains alone, as compared with a mixture of these grains and bran. The mixture of distillers' grains and bran produced 3 per cent more milk than the undiluted grains, no change being observed in the quality of the milk. More milk and butter per unit of dry matter, however, was produced when the grains were fed alone. From a financial standpoint the mixed ration resulted in a gain of three-quarters of a cent daily per cow.

As compared with dried brewers' grains in a test with 6 cows, dried distillers' grains produced 5 per cent more milk and 8 per cent more butter, but owing to their high cost proved less economical.

As compared with a mixture of wheat bran, cotton-seed meal, and linseed meal (2:1:1), dried distillers' grains and bran (2:1) produced, in a test with 6 cows, 1 per cent more solids and 3 per cent more fat, although the total yield of milk was not increased. Owing to the extra cost of the distillers' grains the profit was no greater.

In a test with 5 cows a comparison was made of dried brewers' grains with a mixture of cotton-seed meal, linseed meal, and bran. The 2 rations proved equally efficient, but owing to the lower price of the brewers' grains this material was fed more economically.

Apple pomace was compared with pumpkins in a test with 4 cows. The pumpkins increased the yield of milk 6 per cent. The quality of the milk was uniform on both rations. Neither the health of the cows nor the quality of the butter were injured by feeding pumpkins.

Nutrene dairy feed, a proprietary feeding stuff said to be a sugar-house by-product combined with wheat, corn, and oat products, was not readily eaten, and in the opinion of the author does not seem to be a desirable addition to the list of dairy feeds.

Dried distillers' rye grains produced less milk and butter than other distillers' grains in a test with 1 cow.

Apple pomace silage fed in amounts of 24 to 35 lbs. produced 3 per cent more milk and 5 per cent more butter than did immature corn silage fed in the same

amounts. There was no essential difference in the quality of the milk made on the 2 rations. The yield of milk per unit of dry matter was also practically the same.

Additional data concerning the experimental error involved in feeding trials indicated that under favorable conditions the error by the alternation system is slight.

A comparison of feeding-trial methods, J. L. Hills (*Vermont Sta. Rpt. 1903, pp. 264–274*).—The results of the third test of the 2 methods of feeding designated the alternation system and the combined continuous and alternation system, confirm the conclusions reached in the previous report (E. S. R., 14, p. 1112), that the alternation method is the better of the two. The work is to be continued for several years, although it is not expected that material change in the position taken will be necessary.

On the value of sugar beets as a food for dairy cows, G. W. Berglund (*Nord. Mejeri Tidn., 19 (1904), No. 7, pp. 84, 85*).—Sixty-four cows were fed for 92 days during November, December, and January 200 kilos sugar beets, or about 3 kilos per head daily, in addition to straw, ground barley, and peanut cake. The fat content of the milk was maintained during the beet feeding, while the total production of fat was considerably higher during the months when beets were fed than before or after. The author concludes that, under conditions such as prevailed in this experiment, sugar beets are an excellent feed for milk production, and that they pay much better when used for this purpose than when sent to a sugar factory.—F. W. WOLL.

Effect of feed on the composition of milk, butter fat, and on the consistency or body of butter, J. B. Lindsey et al. (*Proc. Soc. Prom. Agr. Sci., 1904, pp. 113–131*).—This is the third experiment of this character conducted at the Massachusetts Station (E. S. R., 13, p. 385; 14, p. 183). The present experiments were made with 2 lots of 5 cows each and covered 4 periods, varying in length from 3 to 7 weeks each. One lot was fed a standard grain mixture consisting of wheat bran, ground oats, cotton-seed meal, and gluten meal during the entire experiment; while the other lot was fed the standard grain mixture during the first period and the same ration replaced in part by gluten meal, gluten meal and corn oil, and corn meal, respectively, during the 3 remaining periods. Detailed data are reported.

The addition of 0.6 lb. of corn oil increased the fat content of the milk 0.23 per cent, the effect of the corn oil disappearing by the end of the second week. The removal of the corn oil from the ration decreased the fat content of the milk 0.54 per cent, the percentage becoming normal after the first week. Corn oil also appeared to decrease the nitrogen content of the milk. It is not believed to be practicable to feed large amounts of oil to cows, owing to the tendency of this material to derange the digestive organs. The composition of the milk of the lot fed the standard grain mixture for the entire experiment remained practically uniform.

The addition of corn oil decreased the saponification number 10 points and the Reichert-Meissl number 3½ points, and increased the iodin number 9 points. The melting point of the fat remained unchanged. It is believed from the results of the present and earlier experiments that neither the proteids nor carbohydrates, when fed in normal amounts, exert any noticeable influence on the composition of milk nor on the chemical character of the butter fat. The changes that do occur are attributed to the presence of oil in the feeding stuffs. The corn and gluten meal tended to produce a soft butter, and this tendency was noticeably increased by the addition of corn oil to the ration.

Report of the professor of dairy husbandry, H. H. Dean (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 60–76*).—Several lines of experiments are reported upon. Some of these are in continuation of work reported last year (E. S. R., 15, p. 74).

Comparative tests were made of different methods of handling milk for household purposes. The methods included clarifying at 90, 140, and 160° F. by running through a cream separator, pasteurizing at 140, 160, and 180°, and filtering through

cotton batting. Samples of each were then placed in cold storage for 24 hours and scored according to the following scale: Smell 20, taste 25, acidity 35, cream 15, appearance 5. The samples were then either returned to cold storage or kept at room temperatures for another 24 hours and again examined. Averaging all the results, milk pasteurized at 140° scored highest at the end of 24 hours, and milk pasteurized at 180° highest at the end of 48 hours. Pasteurized samples scored higher than clarified samples in every instance. Filtering as well as clarifying appeared to be of doubtful value except for the purpose of removing dirt. Where milk is produced under strictly sanitary conditions heating is considered unnecessary. Under ordinary conditions, however, it is deemed best to heat milk to 140 to 180° and cool promptly to 40 to 50°.

In 6 experiments comparisons were made of the oil test and the Babcock test for cream. The conclusion is drawn that "the oil test is not a very reliable test for dividing proceeds of sales of butter among patrons who deliver cream, and should be superseded by the Babcock test as soon as the change can be conveniently made."

In experiments in butter making comparisons were made of a lactic-acid starter prepared at the college and a culture containing lactic acid and *Oïdium lactis* obtained from a German source. On the whole it was concluded that better results were obtained by using the ordinary lactic-acid culture in pasteurized cream.

The relative advantages of keeping butter in ice cold storage and mechanical cold storage (ammonia system) were studied in 5 experiments. The butter was placed in cold storage as soon as made and scored after about 1 week, 1 month, and 3 months. There was very little difference in the quality of the samples at the first scoring, but at the second and third scorings there was a difference of about 1 point in favor of mechanical cold storage. A comparison was also made of keeping butter in mechanical cold storage at 38 to 40° for 1 week and then removing to mechanical cold storage at 28 to 30° as compared with keeping at the lower temperature for the entire period. The butter placed directly in cold storage at the lower temperature scored higher at the end of 1 and 3 months than similar lots moved from a moderate to a low temperature at the end of 1 week. "While the mechanical cold storage has given the best results as compared with ice for holding butter, the expense and difficulty of operating these machines, as at present constructed, make their use too expensive for the average creamery."

In experiments in cheese making, comparative tests were made of ripening in the ordinary curing room, ice cold storage, and mechanical cold storage. The results of the 2 series of experiments showed that cheese ripened in ice cold storage at 40° was superior in quality to cheese ripened in the ordinary curing room at 61°. The flavor of cheese ripened in mechanical cold storage at 40° was slightly better than that of cheese ripened in ice cold storage at the same temperature. Curing at 40° gave better results than curing at 50°. Cheese ripened for 1 week in an ordinary curing room and then removed to ice cold storage scored slightly lower than cheese ripened entirely in cold storage; while cheese moved at the end of 1 week to mechanical cold storage scored slightly higher than that ripened for the entire period in mechanical cold storage, from which it is concluded that there is little or no risk of injuring the quality of cheese by curing in an ordinary room for 1 week before placing in cold storage. Shrinkage in the ordinary curing room was about 4 per cent for one month, in ice cold storage about 1.9 per cent, in mechanical cold storage at 40° 2.6 per cent and at 50° 3.25 per cent. Cheese moved to ice cold storage at the end of 1 week lost 2.9 per cent, and moved to mechanical cold storage, 3 per cent. On the whole it is concluded that a temperature of 40° gave the best results, and that while the quality of cheese was slightly better in mechanical cold storage, the shrinkage was greater than in ice cold storage. Leaving for 1 week in an ordinary curing room increased the loss in shrinkage, but did not affect the quality to any marked extent.

Determinations were made of the moisture in curd at the time of dipping and milling and in green and ripe cheese. "Normal curds contain about 50 per cent moisture at dipping, 40 per cent at milling, 34 per cent when taken from the hoops, and when ripened in cold storage at a temperature of 38 to 40° the cheese at the end of 1 month will have lost very little moisture." In one series in which an excess of about 2 per cent of moisture was incorporated the quality of the cheese was slightly lower.

In 15 experiments comparisons were made of the use of 2, 3½, and 6 oz. of rennet per 1,000 lbs. of milk, the cheese being ripened in one series in mechanical cold storage at 40° and in another series in ice cold storage at the same temperature. The results showed very little difference in the loss of weight in ripening or in the quality of the cheese. Where it is desirable to hasten the process of ripening it is considered safe to use from 4 to 6 oz. of rennet per 1,000 lbs. of milk without danger of injuring the quality of the cheese, provided the cheese is placed in cold storage soon after being made.

Cheese was ripened in either ice or mechanical cold storage at temperatures ranging from 29 to 53°, the best results being obtained by ripening at a temperature of 40°. While no bad results followed ripening at 29°, there was apparently no advantage in ripening at that temperature.

Cheese was ripened for periods of 1, 2, and 3 months in ice cold storage and then moved to the ordinary curing room and compared with cheese ripened for the entire period in cold storage and in the ordinary curing room. The total score for the different lots was as follows: Cold storage for the entire period 93.8, cold storage for 3 months 92.9, cold storage for 2 months 89.9, cold storage for 1 month 89.3, and in the ordinary curing room 88.1, showing the superiority of cold storage. It is concluded that no rapid deterioration in the quality of cheese which has been kept for 2 or 3 months in cold storage need be expected, provided the cheese was of good quality when made.

Placing cheese on shelves and boxing directly from the press were compared in 8 experiments, from the results of which the following conclusions were drawn:

"Cheese may be placed directly from the press in clean, dry boxes, if kept in either ice or mechanical cold storage, without any danger of injuring the quality of the cheese. The only drawback is the mold on the cheese, especially in an ice storage.

"The boxing of cheese when green and leaving them in an ordinary ripening room is not to be recommended, owing to the 'huffing' of the cheese and the large amount of mold which collects. Spraying with formalin tends to check the latter, while turning the boxes tends to prevent the 'huffing.'

"The cheese put directly into boxes lost considerably less in weight than did those on the shelves, hence the plan of boxing is an advantage in this respect, as it saves shrinkage.

"In this series, as in several of the others, the loss in weight during 1 month was greater in the mechanical storage, but the quality of the cheese was slightly better than were those in the ice cold storage. Both lots were better in quality, and the shrinkage was less than in those ripened in the ordinary room."

Tests were made of different temperatures for cooking curds:

"Heating the curds to temperatures of 102 to 110° tended to reduce the percentage of acid in the curds at all the important stages of the process of cheese making. In the case of curds which tend to 'work too fast,' it would seem advisable to heat them to a higher temperature than usual in order to check the development of lactic acid. It is possible that normal curds may be advantageously heated to a higher temperature than is now considered necessary.

"Heating curds to the higher temperatures appears to reduce the yield of cheese obtained from milk. In our experiments the loss was about 4 lbs. of ripe cheese on 3,900 lbs. milk testing 3.7 per cent fat.

"The average quality of the cheese was improved by cooking the curds at the higher temperature."

Further experiments along this line are considered necessary.

The substitution of sugar-beet pulp for mangel-wurzels was tested with 15 cows during about 3 months. The pulp, which was eaten readily, produced less milk than mangel-wurzels in one period and more milk in another period. When fed with corn silage it is considered advisable to feed no more than 20 to 30 lbs. per cow daily, but when fed with dry feed larger quantities may be given with safety. Pulp is believed to be more valuable in a dry ration than in one containing silage.

The average yearly production of the 20 cows in the dairy herd was 6,711 lbs. of milk and 276 lbs. of butter. The largest yield, 10,214 lbs. of milk and 418 lbs. of butter, was made by a grade Holstein cow.

Record of the station herd for 1902-3, J. L. Hills (*Vermont Sta. Rpt. 1903, pp. 274-283*).—This record is similar in character to those of previous years (E. S. R., 14, p. 1112). The average results for the year were as follows: Number of cows 48, yield of milk 4,910 lbs., yield of butter 294 lbs., cost of food $51, and proceeds from sale of butter $88.15. Records for 9 years have now been obtained. It is hoped that another year some general deductions may be made from the data as a whole.

A preliminary note on the associative action of bacteria in the souring of milk and in other milk fermentations, C. E. Marshall (*Michigan Sta. Spec. Bul. 23, pp. 8*).—Two species of bacteria were isolated from milk, one belonging to the lactic-acid group and one to the peptonizing group, the latter eventually producing slimy milk. These species were grown alone and in combination in a number of experiments, the results obtained being noted briefly in this bulletin.

In the first experiment milk inoculated with the 2 species began to curdle 72 hours before milk inoculated with the lactic-acid bacteria alone. In the second experiment the difference in the time of curdling was 48 hours. These results were found constant in 12 or more trials. The lactic-acid bacteria increased much more rapidly when grown in combination with the peptonizing species than when grown alone. The peptonizing bacteria, on the contrary, decreased gradually and disappeared entirely before the fiftieth hour. It is noted that 2 other micro-organisms have been met with which have the same action as the peptonizing bacteria when associated with the lactic-acid bacteria. Two species have also been found which retard the development of the lactic-acid bacteria. It is announced that detailed studies will follow later.

A preliminary note on the associative action of bacteria in the souring of milk, C. E. Marshall (*Centbl. Bakt. u. Par., 2. Abt., 11 (1904), No. 24-25, pp. 739-744*).—This is noted above from another source.

On the bacteriology of so-called "sterilized milk," W. Robertson and W. Mair (*British Med. Jour., 1904, No. 2283, pp. 1122-1125, dgm. 1*).—Bacteriological examinations were made of 90 samples of so-called sterilized milk supplied by the Leith Corporation for the feeding of infants. Of this number only 14 samples were found sterile. Based upon the results obtained, the authors discuss in a general way the preparation and care of milk for infants.

The formation of film on heated milk, L. F. Rettger (*Studies Rockefeller Inst. Med. Research, 1 (1904), Art. 5, pp. 325-330; reprinted from Amer. Jour. Physiol., 7 (1902), No. 4*).—It is concluded from the experiments reported that the formation of film on heated milk is dependent upon caseinogen, and that the presence of fat and surface evaporation facilitate film formation but are not essential.

Cream testing, C. H. Jones (*Vermont Sta. Rpt. 1903, pp. 191-196*).—Comparative tests were made of measuring and weighing cream containing different percentages of fat. With cream testing less than 40 per cent of fat the use of a correction factor for determinations made with measured cream gave satisfactory results in about 80 per cent of the tests. With cream testing over 40 per cent of fat, 60 per cent of the

tests showed wide divergences. A correction factor is believed to be better than none at all, but if accurate results are desired it is considered necessary to weigh 18 gm. of cream into the test bottle. The data for the tests are reported. A brief summary of the results was given in a previous publication of the station (E. S. R., 15, p. 397).

How long may a finished Babcock test be preserved unimpaired? J. L. Hills (*Vermont Sta. Rpt. 1903, pp. 287, 288*).—Four Babcock tests of fresh unpreserved milk were made by the author in September, 1900. The bottles with their contents, subjected to wide ranges of temperatures, were kept in the dark for 3 years and examined annually. The readings were not impaired at the end of 1 year nor materially affected at the end of 2 years, but were obscured at the end of the third year.

"These results are of interest as indicating the possibilities of preserving the actual analyzed material for future use in cases of dispute. It seems likely that a capped and sealed test bottle, kept in the dark in a cool place, ought to present readable contents for a year or, indeed, 2 years after the tests were made unless perchance the preservative, if such were used, should have some ill effect."

The moisture content of butter and methods of controlling it, G. L. McKay and C. Larsen (*Iowa Sta. Bul. 76, pp. 135–166, figs. 5*).—The authors discuss overrun in butter making and leaky and dry butter and report experiments conducted for the purpose of determining the influence of different factors upon the moisture content of butter.

Directions are given for the calculation of overrun. This, it is stated, should always be made from the fat in the milk or cream delivered by the patron, and not from the composition of the butter. American butter is considered low in water content, about 12 per cent being given as the average. As 16 per cent has been quite extensively accepted as a maximum standard, it is argued that as a matter of business the producer should come as near as possible to this standard without injuring the commercial quality of the butter.

Butter may appear leaky or dull and dry, depending upon the way in which the water is incorporated. The chief factors causing the leaky condition are stated to be churning to small granules, washing very little in cold water, salting heavily while the granules are still small and firm, and working very little in the presence of moisture or brine. The dry appearance may be due to an excess of moisture incorporated by prolonged churning in the buttermilk or wash water, or by churning at a very high temperature. It may also be brought about by overworking, in which case the moisture content as a rule is low. It is stated to be very difficult to differentiate between butter containing much and little moisture. When the moisture has been properly incorporated butter may contain much more than 16 per cent without the fact being recognized except by special methods.

Three experiments were conducted to determine the effect of temperature of cream and wash water on the moisture content of the butter. In each experiment one lot was churned at a temperature of 60 to 64° and one at a temperature of 48 to 54°, all the other conditions being as nearly identical as possible. The average water content of the butter churned at the higher temperatures was 13.83 per cent, and of the butter churned at the lower temperatures 13.24 per cent, indicating no great difference in the moisture content due to temperature alone.

In 6 experiments the influence of the amount of churning was studied. Samples of butter were taken from the same churning at different stages, and in every instance the moisture content was found to increase with the amount of churning, the greatest increase noted being from 13.25 to 22.99 per cent. It is stated that the samples containing a high moisture content appeared a trifle dull in color and very dry, but did not show the moisture in any way. Churning is considered the most effective means of controlling the moisture content of butter.

The effect of overchurning in wash water was studied in 16 experiments. Samples were taken at different stages of churning, as in the previous series. Conditions, such as the temperature of the cream and wash water and the fat content of the cream, varied considerably in the different experiments. Churning at a high temperature and washing with cold water, and also churning at a low temperature and washing with warm water, favored the absorption and holding of considerable moisture. The temperature of the wash water, which it is stated must be left to the judgment of the operator, should be regulated according to the hardness of the butter and in some cases according to room temperature. It is believed that best results can be obtained by using as little wash water as will secure efficient washing. Over 40 per cent of moisture was incorporated in some instances by excessive churning.

"In order to retain the moisture in butter and to incorporate it properly, it is necessary that the butter is not in the hard, round, granular shape when the salt is added. The butter granules must not be churned together to such an extent as to cause butter lumps to appear massive throughout before the salt is added, but the small, somewhat irregular butter granules should be united into larger lumps, so that when the mass of butter is opened with a ladle the small granules can still be distinguished as individuals. At this stage it is in proper condition for salting. By working the butter immediately after the salt has been added, the salt will be dissolved quickly and retained by the butter. Salt has the property of attracting moisture. When added to the butter while in the above-described condition the salt does not seem to have so great a tendency to dislocate and run together the minute drops of water into larger drops. This minute state of division of moisture in butter is seemingly brought about by an increase in churning, a building-up process of moisture and fat globules which can not be accomplished, so far as known, in any other way than by churning it."

In each of 8 experiments all of the conditions were practically alike except the fat content of the cream. The results showed that the richer the cream the higher the water content of the butter. This is attributed to unavoidable overchurning.

In 3 experiments the average moisture content of the butter made from pasteurized cream was 15.06 per cent, and from unpasteurized cream 16.74 per cent, the conditions in each experiment being alike except as regards pasteurization. The buttermilk from the pasteurized cream contained more fat in every instance than the buttermilk from the unpasteurized cream.

The effect of fullness of churn on the moisture content of butter was studied in 5 experiments, the results showing no great difference due to this factor. The average moisture content of butter from small churnings was 16.17 per cent and from large churnings 15.55 per cent. The average moisture content of butter made from sweet cream was 12.09 per cent and from ripened cream 12.62 per cent, indicating that the degree of ripeness had practically no influence upon the moisture content of butter.

The method of incorporating moisture in butter by working in the presence of moisture is condemned. No series of experiments along this line are reported. It is noted that previous experiments have shown that the softer the butter is the easier it will absorb and hold moisture.

In summarizing the work as a whole the conclusion is drawn that temperature, degree of churning, and thickness of cream are the only conditions which materially influence the moisture content of butter; and that if the churning is carried to an excess all the other factors have little or no influence, and also, that temperature is the chief factor affecting the incorporation of moisture on excessive churning. The authors believe that "when temperature of cream and wash water is normal, the per cent of moisture can be easily controlled by different amounts of churning." Increasing the water content of butter by churning in the wash water is considered better than by overchurning in the buttermilk, as the latter method incorporates too much curd and milk sugar.

Experiments on the regulation of the water content of export butter, E. WALLER (*Nord. Mejeri Tidn., 19 (1904), No. 4, pp. 43–45*).—Churning experiments were made under the auspices of Södermanland County Creamery Association, with a view to studying the factors influencing the water content of Swedish export butter. Complete data for the churnings made during the months of March, April, and October, 1903, with the percentages of water contained in the different lots of butter, are given in the paper.

The water content ranged from 11.80 to 16.33 per cent, one of the churnings containing over 14.50 per cent of water, and two less than 12 per cent. The deductions drawn by the author from the results obtained are as follows: A high water content is obtained by continuing the churning as far as can be done without danger of overchurning, so that large butter granules are formed, but not lumps. The butter is furthermore not worked at too low a temperature and not cooled too long or too low between salting and working; if possible, it is cooled at 8 to 9° C., and it is also preferably worked at this temperature, at which there is no special danger of overworking.—F. W. WOLL.

Studies upon the keeping quality of butter. I.—Canned butter, L. A. ROGERS (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 57, pp. 24*).—This bulletin deals with the changes occuring in canned butter, the intention being to submit a second paper treating of packed butter. The decomposition of sugar, casein, albumin, and fat is discussed briefly, reference being made to the literature of the subject.

An examination was made of a number of samples of canned butter collected in China, the Philippine Islands, Cuba, and Porto Rico and kept in Washington for about one year. All of the samples showed more or less decomposition. Bacteriological examinations gave negative results in most instances. The few micro-organisms found belonged to the resistant spore-forming group. The increase in the amount of free acid liberated by the breaking up of glycerids was comparatively small. Sterile butter sealed in small tubes and kept at 23° C. for 100 days showed no increase in acidity, indicating that the decomposition of butter under anaerobic conditions is not due to physical agents such as heat and moisture.

Two lots of freshly canned butter were kept at room temperatures and examined at frequent intervals as regards condition, acid number, and bacterial content. In from 250 to 300 days the samples showed a disagreeable fishy flavor and a strong penetrating odor. An increase in the acid number accompanied the progressive change in flavor. The bacteria found were mostly of the lactic-acid type, although small numbers of yeasts and a few liquefying bacteria were present. The lactic-acid bacteria, constituting in some cases over 99 per cent of the total number, and the yeasts decreased rapidly, being practically absent at the end of 100 days. The changes in acidity and flavor progressed steadily after the disappearance of the micro-organisms, showing that the changes were not due to the direct action of the living cells.

Butter treated with thymol to prevent bacterial growth showed a progressive increase in acidity, while butter from the same lot subjected to heat and also treated with thymol remained practically unchanged as regards acid content: from which the conclusion is drawn that the decomposition is due to an enzym unaffected by the antiseptic but destroyed by the heat. The sources of this enzym, namely, secretion with the milk in the udder and production in the milk or butter by micro-organisms, are discussed. Experiments showed that a species of Torula isolated from butter possessed distinct lipolytic action. The presence of a fat-splitting enzym inherent in milk was shown in an experiment in which butter made from fresh unheated cream and treated with formaldehyde to prevent the growth of micro-organisms showed an increase in acid content, while a control sample made under the same conditions but subjected to heat to prevent the action of enzyms showed no change in the acid content.

"It appears from this record of investigation that the only rational conclusion is that the changes which ordinarily occur, or which first occur in canned butter, destroying its fine, fresh flavor and producing other flavors more or less disagreeable, are due to the liberation of free acid, caused mainly, if not wholly, by the action of an enzym, which, produced in the milk or secreted with the milk in the udder of the cow, is carried over into the butter, or are, in some cases at least, produced in the butter itself through the activity of certain micro-organisms. It seems reasonable to presume that the same agents, the enzyms of the milk acting alone or in conjunction with the yeasts and their resulting enzyms, are responsible for the so-called 'fishy' flavor in butter packed in large but unsealed vessels."

On the keeping quality of sour cream butter and sweet cream radiator butter, A. Voss-Schrader (*Landtmannen, 14 (1903), No. 42, pp. 663, 664; Tidn. Mjölkhushall., 12 (1903), No. 40, p. 158*).—Two series of experiments were made in 5 different Finnish creameries, in which the keeping qualities of butter manufactured from ripened separator cream and of radiator butter were ascertained by two careful scorings, 4 and 26 days apart. The water contents of the different lots of butter were also determined.

The sweet-cream butter scored 0.6 of a point less on the second scoring, on the average, than on the first one (average score 36), while the second score of the sour-cream butter was 3.2 points lower than the first score (average score 35). The average score of the radiator butter was 2.4 points higher than that of the separator butter. The average water contents of the butter manufactured by the two methods were 16.43 and 13.86 per cent for radiator and separator butter, respectively.—F. W. WOLL.

On the keeping quality of butter, S. C. Buhl (*Mälkeritid., 16 (1903), No. 40, pp. 709, 710*).—The author draws the conclusion from the examination of 191 tubs of Danish butter scored when 10 days and 21 days old, that high-grade butter will also prove of superior keeping quality unless there is some specific cause why it will not keep well.—F. W. WOLL.

A study of the chemical changes which take place in cheese during the ripening process, W. P. Gamble (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 54, 55*).—This is a brief summary of the results of the investigations which have been conducted at the Ontario Agricultural College during a number of years.

The chemistry of cottage cheese, F. H. Hall, L. L. Van Slyke, and E. B. Hart (*New York State Sta. Bul. 245, popular ed., pp. 10, fig. 1*).—A popular summary of the bulletin previously noted (E. S. R., 15, p. 1004).

Report of the professor of bacteriology, F. C. Harrison (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 96–112*).—The results of bacteriological work during the year are briefly summarized, and investigations on the duration of the life of the tubercle bacillus in cheese, previously abstracted from other sources (E. S. R., 12, p. 985; 14, p. 292), are reported.

International Congress of Dairying, L. Gedoelst and M. Henseval (*Rev. Gén. Lait, 3 (1904), Nos. 7, pp. 156–163; 8, pp. 181–188; 9, pp. 203–210; 10, pp. 228–233; 11, pp. 253–257*).—A summary of the proceedings of this congress held at Brussels, September, 1903. The addresses and discussions related mainly to the repression of frauds, milk hygiene, and the formation of an international dairy association.

Statistics of the dairy, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 55, pp. 88, maps 4, dgms. 5*).—This is a compilation from the United States Census for 1900, and from other sources, of the principal statistics relating to the dairy industry in the United States, with some similar data for foreign countries, and with explanatory notes.

VETERINARY SCIENCE AND PRACTICE.

A study of natural immunity, R. Turró (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 103–111*).—The literature of this subject is briefly discussed. The author's experiments were largely confined to a study of oviserum obtained from a solution of the yolk of hen's eggs in albumen. After a period of 20 to 30 days this mixture developed such a pronounced bacteriolytic power as to destroy ¼ of its weight of an anthrax culture without losing any of its strength. Repeated injections of oviserum followed by inoculation with anthrax bacilli were found to hasten the death of rabbits. A single injection of 5 gm. oviserum per 1 kg. of live weight of the animal was found to prolong the course of the disease.

A report on infection, natural and artificial immunity, toxins, immune sera, etc. (*Jahresber. Thier-Chem., 32 (1903), pp. 889–986*).—An elaborate bibliography is presented of literature relating to this subject and published during the year 1902. The more important articles are reviewed at considerable length.

Immune sera, A. Wassermann, trans. by C. Bolduan (*New York: John Wiley & Sons, 1904, pp. IX+77, figs. 4*).—In this volume a general account is given of the nature, chemical affinities and action of hemolysins, cytotoxins, and precipitins. The relation of these bodies is discussed with special reference to the various theories of immunity and susceptibility to bacterial diseases.

The coagulating power of serum, J. Bordet and O. Gengou (*Ann. Inst. Pasteur, 18 (1904), No. 2, pp. 98–115*).—This article contains the results of the continuation of the authors' studies regarding the coagulation of the blood and the factors which are concerned in this process. It was found during these investigations that the serum possessed not only the power of coagulating fibrinogen, but also of increasing considerably the production of fibrin ferment at the expense of the ferment which was peculiar to the blood plasma. The power of transforming fibrinogen into fibrin was exercised even in the absence of lime, while the increase in the production of ferment requires the presence of calcium salts for its operation.

Experiments relating to the phenomenon of agglutination, C. Nicolle (*Ann. Inst. Pasteur, 18 (1904), No. 4, pp. 209–240, figs. 7*).—Attention is called to the necessity of adopting a uniform technique in arriving at satisfactory results from experiments in different phases of agglutination. The author's experiments involved the use of a number of bacterial organisms, especially the typhoid bacillus, and the experimental animals were chiefly rabbits. While it is possible to produce a specific and quite powerful agglutinin in bacterial cultures, this agglutinin is considered as distinct from the agglutinin produced in a living animal body by the use of cultures of the same bacillus. The agglutinin is apparently, in the case of some species of bacteria, produced by the flagella of the bacteria.

Contributions to the study of hemagglutinins and hemolysins, W. W. Ford and J. T. Halsey (*Jour. Med. Research, 11 (1904), No. 2, pp. 403–425*).—As a result of the comparative study of the various chemical bodies in the blood of mammals and birds the authors conclude that the use of the constituents of the blood corpuscles, laked blood, or stroma of one species of animal results in the production of specific bodies—lysins and agglutinins. In a serum which is strongly hemolytic, a rapid solution of the blood corpuscles conceals the appearance of agglutination. In an immune serum the solution of the blood corpuscles in high dilutions may not take place, although agglutination occurs promptly. It is concluded that the phenomena of agglutination and lysis can not be made to occur independently by the injection of different constituents of the blood corpuscles. These phenomena are held to be inseparably connected.

Blood immunity and blood relationship, a demonstration of certain blood relationships amongst animals by means of precipitin tests for blood, G. H. F. Nuttall (*Cambridge: Univ. Press, 1904, pp. XII+444, pls. 2, figs. 4*).—The

purpose of this volume is to discuss the results of an extensive series of experiments conducted by the author in determining the relationship of animals to one another by means of blood tests.

A general account is given regarding the nature of toxins, ferments, agglutinins, and precipitins of various sorts with especial reference to the action of these bodies in the production of immunity. The volume also contains an account of quantitative tests with precipitins for the blood of mammals and birds and a discussion of the blood relationship between the lower vertebrates and arthropods, as shown by 2,500 tests with precipitating antisera. In carrying out these last-named experiments, the author was assisted by T. S. P. Strangeways and G. S. Graham-Smith. The literature relating to serum constituents and immunity is critically discussed in connection with an extensive bibliography.

As a result of the author's experiments, it appears that there are many points of resemblance between different antibodies. It is suggested that much improvement may be made in the methods of obtaining antisera for use in precipitin tests. The precipitins and precipitable substances combine in a quantitative manner. The rate of interaction between these two substances is greatly influenced by the temperature being retarded by cold and hastened by heat. Apparently the precipitin content of serum in the body undergoes considerable fluctuation during the process of immunization. As a rule, precipitins and antisera are strictly specific in action when used in high dilutions. The more powerful the antisera is, however, the greater is its action upon blood of different species of animals.

Atlas and outlines of bacteriology, a text-book of special bacteriological diagnosis, K. B. Lehmann and R. O. Neumann (*Atlas und Grundriss der Bakteriologie und Lehrbuch der Speziellen Bakteriologischen Diagnostik. Munich: J. F. Lehmann, 1904, 3. ed., vol. 1, pp. 94, pls. 76; vol. 2, pp. XVI+623, figs. 38*).—In this volume the authors present a general account of bacteriology including the classification, biology, and morphology of bacterial organisms and pathogenic microbes. The functions and physiological action of bacteria are considered in detail and special accounts are presented on the biological relations and pathological effects of various bacteria which cause diseases of animals and plants.

Bacteriological diagnosis for veterinarians and students of veterinary science, J. Bongert (*Bakteriologische Diagnostik für Tierärzte und Studierende. Weisbaden: Otto Nemnich, 1904, pp. VI+276, pls. 20, figs. 7*).—This volume contains an account of the use of the microscope in the diagnosis of animal diseases, methods of microscopic and bacteriological examination, the morphology and biology of bacteria, and a detailed account of biological and morphological characters of the various bacterial organisms which are pathogenic for animals.

Staining certain bacteria (glanders bacillus, typhoid bacillus, etc.) in sections of the skin and other organs, K. Zieler (*Centbl. Allg. Path. u. Path. Anat., 14 (1903), No. 14, pp. 561–565*).—The author's method consists in the use of any desired fixing and hardening solution and in embedding in paraffin. Sections are then stained for 8 to 24 hours in a solution of orcein, after which they are washed in alcohol and water, stained in polychromic methylene blue, and differentiation of internal structures is brought about by treatment with a mixture of glycerin and ether.

A simple method of demonstrating the presence of bacteria in the mesentery of normal animals, A. G. Nicholls (*Jour. Med. Research, 11 (1904), No. 2, pp. 455–468, pl. 1*).—During the author's experiments on the lower animals it was found that bacteria could be demonstrated in the mesenteries and in various internal organs of normal animals. It is concluded, therefore, that the old doctrine of the sterility of normal organs is a false conception. The author believes that normal organs are not actually sterile but only potentially so. Bacteria may be readily carried into them and, in health, undergo quite rapid destruction.

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A study of chronic infection and subinfection by the colon bacillus, G. A. Charlton (*Jour. Med. Research, 11 (1904), No. 2, pp. 507–519*).—The inoculation experiments reported in this paper were made in rabbits. It was found that as a result of infection with the coli bacillus a pronounced anemia was produced, somewhat resembling pernicious anemia in man, and accompanied with a great diminution in the number of red blood corpuscles. The disease differs from pernicious anemia, however, in producing a decrease of hemoglobin parallel with the decrease of the red blood corpuscles. In advanced stages of infection a diffuse degeneration of the spinal cord was brought about affecting chiefly the posterior and lateral columns of the cord.

The action of artificial oxydases on the toxin of tetanus, A. Lumière et al. (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 10, pp. 652–654*).—Experiments were carried out during which artificial oxydases composed largely of mineral substances, such as salts of manganese, iron, and cerium were used in testing their effects upon tetanus toxin. The samples of the toxin thus treated were later tested by the inoculation of guinea pigs. It was found that these artificial oxydases, whether of an alkaline or acid reaction, exercise considerable effect upon the toxin of tetanus. The salts of cerium, cobalt, and nickel, as well as those of iron and manganese, attenuate or entirely destroy tetanus toxin.

Proceedings of the American Veterinary Medical Association for 1903 (*St. Paul: Pioneer Press Co., pp. 346, pl. 1, figs. 60*).—The fortieth annual meeting of the association was held in the City Hall, Ottawa, Canada, September 1–4, 1903. The papers which were read at these meetings have been previously noted (E. S. R., 15, pp. 112–119). The present published form of the proceedings contains four other papers which were read by title only, together with a list of the members and an account of the business of the sessions.

Tumors in domesticated animals, J. Desmond (pp. 204–212).—In this paper submitted by the government veterinarian of South Australia, an account is given of various tumors of horny and other nature as observed in domesticated animals. Horns on the skin of animals are classified in 4 varieties, viz, sebaceous, wart horns, hoof horns, and cicatricial horns. Notes are also given on tumor-like growths in various organs, especially a case of true endothelioma, which is reported as the first case of this sort observed in animals.

An outbreak of epizootic encephalitis of the horse in South Carolina, G. E. Nesom (pp. 213–215).—This disease is said to have prevailed in the South for more than 50 years, being especially severe in the southern Atlantic States. It has been known by a number of common names and has been referred to a number of causes. The author believes, however, that all well-investigated cases are due to eating damaged corn or hay, or sometimes both of these feeds, in a moldy or spoiled condition.

A question relating to the serum-therapy of the aphtha epizootica—its actual state, E. Perroncito (pp. 283–291).—The literature relating to this subject is critically reviewed by the author. The results obtained thus far are encouraging but are not quite satisfactory. It is urged that further study should be made of this problem in order to devise means for the preparation of a more efficient serum in the treatment of foot-and-mouth disease.

A preliminary report on the sheep disease, ictero-hæmaturia, in Western Montana, H. P. Johnson (pp. 301–313).—This disease was observed in Montana in 1890. It is largely confined to Deer Lodge and Silver Bow valleys. The disease is considered as identical with carceag of Europe, and is due to the action of the blood parasite *Piroplasma ovis*. The means of transmission of the disease are not understood. It is suggested that this occurs through the agency of some biting insect, perhaps the sheep tick. Experiments with this insect, however, gave negative results. No success was had in reproducing the disease by means of inoculation with virulent blood. It is suggested, therefore, that infection with this disease requires a peculiar susceptibility derived by digestive organs.

Report of the live stock sanitary board of Wisconsin for 1901-2, G. McKerrow, E. D. Roberts, and H. L. Russell (*Wisconsin State Live Stock Sanit. Bd. Rpt. 1901-2, pp. 71, pls. 2*).—During the 2 years under report a study was made of tuberculosis in cattle. Numerous tuberculin tests were made and the data obtained from these tests are presented in a tabular form. Notes are given on the geographical distribution of the disease in the State of Wisconsin.

Statistics were collected regarding the comparative susceptibility of different breeds of cattle to tuberculosis. From the data thus obtained it is impossible to conclude that 1 breed is more susceptible than another. The most important means of spreading the disease from place to place is believed to be through the medium of animals which are bought and sold. A copy is given of regulations of the live-stock sanitary board regarding methods of disposal of the carcasses of tuberculous animals, isolation and quarantine of tuberculous animals, and shipment of such animals for immediate slaughter. The authors discuss briefly the subject of disinfection of premises after the prevalence of contagious diseases. Recommendations are made of various chemicals for use in such work.

Glanders is said to be a very serious disease in the State. A large proportion of cases appear to originate from range horses imported from western States. A copy is given of a regulation regarding the quarantine and inspection of such horses. Notes are also given on anthrax. This disease in 1 outbreak was shown to be carried for considerable distance in water which percolated through the soil. The prevalence of rabies, hemorrhagic septicemia, and blackleg are also discussed.

Report for the years 1902-3 of the principal of the Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England, 64 (1903), pp. 262-285*).—Anthrax is said to be on the increase throughout Great Britain. This spread of the disease is not believed to be due to local conditions, but to fresh importation of the pathogenic micro-organisms from outside sources. The suggestion is made that infection in many instances may be due to the importation of infected feeding stuffs. Hog cholera appears to be on the decline. Statistics show that the number of cases in 1903 was considerably fewer than in the previous two years. It is not believed possible, however, to eradicate this disease for some time to come.

Glanders is more prevalent than heretofore. Numerous experiments were made in the application of the mallein test and the question of infection from reactors and ceased reactors was tested. It was found that horses which merely react to glanders are capable of transmitting the disease, but that such transmission does not occur as a rule. During the author's experiments eleven ceased reactors were placed in contact with healthy horses without any case of transmission of the disease having been observed as a result.

Notes are given on the status of the problem of tuberculosis. The author believes that the evidence points to the identity of the human and bovine forms of this disease. A contagious disease of the udder in cows was observed, and experiments in combating this trouble indicate that the general cleansing and disinfection of the premises repeated three times is sufficient to check the disease in a decided manner.

Brief notes are also given on stomach worms in ruminants, on a form of vaginitis in breeding ewes, and on the introduction of epizootic lymphangitis among the horses of Great Britain. The occurrence of this disease in Great Britain is believed to be due to importations which occurred during the progress of the South African war.

Report of the division of veterinary science, J. A. Gilruth (*New Zealand Dept. Agr. Rpt. 1903, pp. 190-336, pls. 23, figs. 2*).—A brief statement is given of the staff of veterinarians and inspectors in the veterinary service of New Zealand, together with notes on laboratory work, registration of veterinary surgeons, veterinary lectures to farmers, unsoundness in horses, quarantine regulation, strangles, dairy inspection, management of dairy herds, and inspection in abattoirs. On account of the increasing importance of strangles the author recommends that immediate steps be taken

to control this disease. Statistics are presented showing the number of carcasses condemned in the prosecution of meat inspection, and the causes for which condemnation was made. Certain desirable changes are suggested in the inspection law of the colony.

The work on tuberculosis during the year was largely of a routine nature. A general discussion of the relationship of bovine and human tuberculosis is presented, in which the position is taken that these two forms of the disease are due to the same organism and are intertransmissible.

An elaborate study was made of hepatic cirrhosis in horses and cattle. This is a continuation of studies which have been in progress for a number of years and the author was able to demonstrate clearly that the cause of this disease is *Senecio jacobaea*. This plant is described and notes are given on its distribution in New Zealand and elsewhere. The disease has existed in New Zealand for the past 20 years and has seriously affected both horses and cattle. The symptoms during the whole course of the disease in horses and cattle are described in detail, and notes are given on the pathological changes in the liver. The most characteristic lesions occur in this organ in the form of extravasations of blood, distension of the intralobular veins, coalescence and formation of hepatic giant cells, deposition of brownish-yellow pigment in the liver cells, and the accumulation of an interlobular fibrillar tissue which causes the characteristic cirrhotic appearance.

Numerous experiments were made in feeding this plant in various conditions to horses and cattle. During these experiments it was shown that the disease could readily be produced by feeding the plant in a cut and dried condition or in a green condition. Where the plant was allowed to stand on the ground until entirely dead and dry, however, the poisonous principle seemed to have been lost. The characteristic symptoms with fatal outcome were brought about by allowing horses and cattle to feed upon the plant in bloom in an inclosed field. Sheep withstand the effects of the plant for long periods and apparently relish the weed. Under certain circumstances however, especially after long-continued grazing upon the plant, cirrhotic conditions are produced in sheep.

In treating the disease no satisfactory results can be expected after pronounced lesions have developed in the liver. In the early stages of poisoning, however, apparent recovery was brought about by the administration of Barbados aloes in 7 dr. doses followed by strychnin in doses of $\frac{3}{4}$ gr. for 1 month or longer. In some cases of apparent recovery, however, the disease subsequently recurred with fatal results. In cattle treatment with strychnin and sodium sulphate gave the best results. The disease is believed to be identical with Pictou disease of Canada and with 1 form of stomach staggers reported from Great Britain.

Notes are also given on contagious mammitis in cows, anthrax, contagious abortion in cattle, hog cholera, blackleg, verminous pneumonia, various tumors in domestic animals, etc. The cause of 1 outbreak of contagious mammitis was found to be a streptococcus which produced no serious results in guinea pigs, rabbits, and cattle when inoculated subcutaneously or intravenously, but produced mammitis in cattle when injected into the udder. It was shown that the disease was transmitted from 1 animal to another on the hands of the milker. Anthrax spores were demonstrated in bone fertilizer, and the importance of this fact is emphasized by the author. The careful application of antiseptic measures were successful in eradicating contagious abortion from a number of herds. Attention is called to the importance of a serum test in the diagnosis of doubtful outbreaks resembling hog cholera. It was found that a red coloration observed in certain samples of butter was due to the growth of *Aspergillus nidulans*.

Report of chief veterinary inspector, J. G. RUTHERFORD (*Rpt. Min. Agr. Canada, 1903, pp. 69-151*). The author calls attention to the organization of the veterinary-inspection service of the Dominion of Canada, with special reference to

the work of the various inspectors in different parts of Canada and of the biological laboratory. Notes are given on hog cholera, tuberculosis, glanders, Pictou cattle disease, sheep scab, cattle mange, blackleg, foot-and-mouth disease, and various other diseases of domesticated animals.

The spread of hog cholera is said to be partly due to difficulty in obtaining strict observance of quarantine regulations by railroad employees and to the tendency of farmers to conceal cases of the disease. Glanders has prevailed to a serious extent. During the season 313 horses were destroyed after a positive reaction from the mallein test. The author outlines his method of quarantining incipient cases of glanders, some of which recover.

Notes are also given on the quarantine stations, car inspection, and stock yards.

The pathologist, C. H. Higgins, presents a report on the operations of the biological laboratory (pp. 93–107). This work involved a study of anthrax, tuberculosis, glanders, hog cholera, hemorrhagic septicemia, actinobacillosis, and Pictou cattle disease. Reports are also presented by various other inspectors concerning the prevalence of animal diseases in various parts of Canada.

In a study of Pictou cattle disease some corroboration was obtained for the belief that this disease is due to the *Senecio jacobœa*. The evidence obtained in Canada, however, is not considered conclusive, and arrangements have been made for an extensive experiment for determining this point on a farm of 200 acres rented for the purpose.

Report of the chief inspector of stock, J. R. WEIR (*Jour. Dept. Agr. Victoria, 2 (1903), No. 3, pp. 242–244*).—The recent prolonged droughts caused an unusual number of deaths among the stock on account of the scarcity of suitable forage upon the range. Notes are given on the prevalence of tuberculosis, actinomycosis, and swine diseases.

Diseases of stock, W. E. DAVIDSON (*Pretoria: Government Office, 1903, pp. 12.*)—Copies are given of the regulations made by the Lieutenant-Governor of the Transvaal regarding the importation and quarantine requirements for domestic animals. Specific statements are made concerning rinderpest, pleuro-pneumonia, tuberculosis, foot-and-mouth disease, glanders, anthrax, sheep scab, and hog cholera.

Quarantine rules and regulations (*Gen. Circ. West. Trunk Lines, No. 72, pp. 80*).—Copies are presented of quarantine rules and regulations of the United States Department of Agriculture and of the various States and Territories, Mexico, and Canada, in so far as these rules apply to State and interstate traffic. The circular is revised up to February 22, 1904.

Canadian regulations relating to animals' quarantine (*Ottawa: Government Printing Office, 1904, pp. 15*).—Copies are given of quarantine regulations issued by the Canadian Government regarding the importation of cattle, sheep, hogs, horses, mules, and other animals for the purpose of controlling the distribution of infectious diseases.

Lessons in disinfection and sterilization, F. W. ANDREWS (*London: J. & A. Churchill, 1903, pp. 222; rev. in Public Health* [*London*], *16 (1904), No. 6, p. 374*).—As explained by the subtitle, this volume, which is an expansion of a series of lectures delivered to hospital nurses, presents an elementary course of bacteriology, together with a scheme of practical experiments illustrating the subject-matter.

Experiments in burning animal bodies in the open air, G. I. SVYETLOV *Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 3, pp. 235–253*).—A commission was appointed from the Russian veterinary service for the purpose of investigating the feasibility of burning bodies of animals dead of contagious diseases and the best methods for accomplishing this. Notes are given on the time required for complete incineration of such carcasses under different conditions.

The disposal of animal carcasses by incineration, LOTHES and O. PROFÉ (*Fortschr. Vet. Hyg., 1 (1904), No. 12, pp. 325–328*).—Data are presented showing

the amount of wood or other fuel necessary for incinerating given weights of animal bodies. The cost of destroying the carcasses by this method may be readily estimated from such data. While it is recognized that this method involves the destruction of much valuable material, it is considered necessary for the present to incinerate carcasses of animals dead of highly infectious diseases.

Abridged bibliography of infectious diseases, D. MONFALLET (*Bibliographie Abrégée des Infections. Paris and Santiago: C. Goffi, 1903, pp. 65*).—In this bibliography the author's purpose was to present for the practical investigator and student a list of the most important publications relating to the various infectious diseases of animals and man. The number of diseases on which bibliographies are presented is about 90.

The principles and conditions of combating epizootic diseases, V. NAGORSKI (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 1, pp. 1–26, figs. 7*).—A general discussion of the principles involved in eradicating infectious diseases, including an account of quarantine measures, medicinal treatment, disinfection, and preventive vaccination.

The relations of human and bovine tuberculosis, V. A. MOORE (*Cornell Countryman, 1 (1904), No. 5, pp. 137, 138*).—The author outlines in a brief manner the history of the controversy regarding the identity of these 2 forms of tuberculosis. The opinion is maintained that results of investigations indicate conclusively that human and bovine tuberculosis are essentially identical.

Human and bovine tuberculosis, A. D'ESPINE (*Rev. Sci. [Paris], 4. ser., 20 (1903), No. 19, pp. 593–596*).—The author reviews briefly the literature bearing on the relationship between these 2 forms of tuberculosis, and concludes that the evidence is very strong in favor of their identity.

Tuberculosis of cattle as related to that of man, E. PERRONCITO (*Extract from Gaz. Med. Ital., 54 (1903), No. 22, pp. 4*).—As a result of the author's experiments and studies of this disease together with a review of the literature of the subject, it is concluded that the human and bovine forms of tuberculosis are essentially the same and are intertransmissible.

An inquiry into the primary seat of infection in 500 cases of tuberculosis, J. O. SYMES and T. FISHER (*British Med. Jour., 1904, No. 2259, pp. 884, 885*).—On account of the importance of determining the extent of infection of man from eating the milk and meat of tuberculous animals, statistics were compiled by the authors relating to 500 fatal cases of tuberculosis in man. From these statistics it appears that, if the local foci of disease are considered as evidence of the primary seat of infection, the percentage of infection during the first 12 years of life is 4 times as great in the air passages as in the alimentary tract.

The reaction of tuberculous animals to subcutaneous infection with the tubercle bacilli, F. A. DELLA CELLA (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 12, 13*).—Experiments were carried out for the purpose of determining what local alterations are caused as a result of subcutaneous inoculation with tubercle bacilli. For this purpose cultures were used which, in moderate doses, caused the death of guinea pigs within a period of 2 weeks. It was found that by greatly reducing the size of the dose the course of infection was much slower.

In 1 experiment 10 guinea pigs were inoculated and 20 days after infection were again inoculated subcutaneously with a minute dose of virulent tubercle bacilli. In nontuberculous animals similarly inoculated no local reaction took place until after 12 days, while in the tuberculous animals a pronounced local lesion was observed on the day following the inoculation. Similar results obtained in other experiments convinced the author that there existed a sort of local immunity in the subcutaneous connective tissue against tubercle bacilli. This immunity is brought about by previous inoculation and is indicated by the almost uniform absence of tubercle bacilli at the point of inoculation in tuberculous animals and the presence of the bacilli in control animals.

The morbid anatomy and etiology of avian tuberculosis, V. A. Moore (*Jour. Med. Research, 11 (1904), No. 2, pp. 521–536, pl. 1*).—The literature of this subject is critically reviewed in connection with numerous bibliographical references. Notes are given on the symptoms of tuberculosis in fowls and on the pathological lesions. A number of experiments were carried on for the purpose of determining the method of natural infection. Negative results were obtained from feeding fowls on the sputum of tuberculous patients, but it appears probable that infection of fowls naturally takes place through the alimentary tract, and that the disease is spread largely through the excreta.

The tuberculosis (animal) compensation bill, A. J. Laird (*Public Health [London], 16 (1904), No. 7, pp. 418–421*).—The author states that considerable support has been promised in Parliament to a proposed bill granting indemnity for slaughtered tuberculous animals. Attention is called to the various opportunities which will be furnished for frustrating the legitimate purposes of this bill and for the practice of fraud in obtaining indemnities.

On anthrax, J. Dunstan (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 75–91*).—This disease is reported as being on the increase in Great Britain, despite the efforts which have been made to control it. The number of animals which die annually of the disease is, however, rather small as compared with the losses from other causes. Detailed notes are given on the symptoms, methods of diagnosis, and the control of the disease.

The morphology and biology of anthrax bacillus, H. Preisz (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), Nos. 3, pp. 280–293; 4, pp. 416–434; 5, pp. 537–545; 6, pp. 657–665, pls. 2*).—An elaborate study was made of the various forms under which the anthrax bacillus occurs on different nutrient media with special reference to the formation of spores. The literature relating to this subject is reviewed in connection with a bibliography.

Preparations of anthrax bacillus were stained in different ways, and a study was made of the various structures which could be identified in the body of the bacillus after treatment with different stains. As a result of the author's study of this organism, it is concluded that the formation of spores always takes place in the end of the cell and that the peripheral layer of the cell body is especially concerned in this process. The author believes that the cell nucleus is not related to the spore. It was found in studying the various cultures of the anthrax bacillus that a certain percentage of them could not be induced to form spores.

Investigation of natural and artificial immunity to anthrax, A. Pettersson (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 71–83*).—This article is occupied with a discussion of artificial immunity to anthrax in dogs. During these studies the author carried out numerous inoculation experiments and examined various tissues from pathological and chemical standpoints. It was found that infection of anthrax produces considerable increase in the bactericidal power of the blood. The serum in itself appears to be quite inactive both before and after infection. During the process of immunization of the dog toward the anthrax, no formation of new immune bodies takes place, but the production of complement is considerably increased. There is also a marked increase in the number of leucocytes, which probably assist in distributing the complement to points where it may be most effective.

The immunizing action of the nucleoproteid extracted from anthrax bacilli, N. Tiberti (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 62–71*).—The author describes in detail his method of obtaining a nucleoproteid from anthrax bacilli. The experimental animals used by the author were rabbits and guinea pigs. In 1 series of experiments, 12 rabbits were treated with varying doses of nucleoproteid and inoculated gradually with virulent cultures of anthrax at different periods of time, and of this number 8 survived while 4 became infected with anthrax.

In a second experiment, 9 out of 12 rabbits resisted infection. The author concludes, therefore, that it is possible to produce an active immunity in a majority of cases by inoculation with the nucleoproteid contained in anthrax bacilli.

The bactericidal power of plasma-free blood, plasma, and serum of normal pigeons and those which have been immunized against anthrax, S. SPANGARO (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 83–91*).—The author describes his method for obtaining what he denominates pure blood, or blood free from plasma. Such material and also the plasma and serum were tested for the purpose of determining their bactericidal action. The plasma and serum were found to possess no demonstrable bactericidal power, while this power in pure blood was very conspicuous. The difference between the blood of the normal and immunized pigeons consists simply in the intensity of the bactericidal power, being much greater in the latter. A large quantity of bacilli in pure or plasma-free blood may be completely destroyed within a period of 2 or 3 hours.

Transmission of African coast fever, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 24 (1904), No. 4, pp. 428–432, pls. 3*).—According to the investigations thus far made on the etiology of African coast fever it appears that the brown tick (*Rhipicephalus appendiculatus*) is the chief and perhaps the only natural means of transmitting this disease to cattle.

The brown tick is widely distributed in South Africa. Notes are given on the habits and life history of the tick with especial reference to the relationship between its habits and the transmission of the disease. The brown tick is found chiefly on cattle, but may also infest horses, asses, mules, sheep, goats, dogs, and cats. It was first shown in November, 1902, that this tick was concerned in the transmission of African coast fever, and subsequent experiments have confirmed the results obtained at that time.

The most effectual means of controlling the brown tick has been found in repeated dipping in arsenical dips. This process may take place every 2 weeks during the warm season, and is effective in destroying other species of ticks as well as the one under consideration.

Rhodesian redwater or African coast fever, R. KOCH (*Agr. Jour. Cape Good Hope, 24 (1904), No. 5, pp. 549–560*).—This constitutes the author's fourth report on the subject of African coast fever. Many of the experiments reported in previous articles have been repeated and results obtained which are believed to be reliable.

The general results of the author's investigations indicate that African coast fever is a cattle disease due to a specific blood parasite distinct from that of Texas fever. The 2 diseases, however, may exist simultaneously in the same animal and, under such circumstances, hemoglobinuria is observed. The disease did not originate in Rhodesia, but was introduced from the eastern coast. It is not transmissible directly, but only through the agency of ticks. The mortality is very high, usually about 90 per cent. Recovered animals are immune to subsequent attacks, but retain small numbers of the parasites in their blood. Such animals are therefore capable of transmitting the disease to other animals through the agency of ticks.

The disease can not be reproduced by means of single injections of virulent blood. Repeated injections, however, at intervals of 2 weeks produce a mild infection, which after a period of 4 or 5 months results in a permanent immunity. In obtaining blood for inoculation purposes care should be exercised that it does not contain organisms of other diseases. Notes are also given on other means of prevention, especially dipping for the destruction of ticks.

Heart-water inoculation experiments, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 24 (1904), No. 4, pp. 433–442*).—Experiments had already indicated the possibility of immunizing goats to heart-water by means of intravenous injections of the blood of recovered animals. The animals which had just been immunized were exposed to natural infection with virulent heart-water, and were also inoculated

intravenously with virulent blood. The results obtained from this experiment were highly satisfactory. It appeared that the 3 sheep used in the experiment successfully withstood the inoculation with large doses of virulent blood, while 1 of the 2 goats resisted inoculation and the other died.

The organism of toxemic hemoglobinemia in cattle in Kuban, Russia, E. Djatschenko (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 6, pp. 727–729*).—In studying cases of this disease the author found a spirillum which grew rapidly on agar at a temperature of 27 to 30° C. Inoculation experiments were made on rabbits, white rats, and mice with negative results in every case. The author believes, however, that the organism which he discovered may prove to be the cause of the disease and proposes for it the name *Spirillum tschichir.*

An epizootic outbreak of rinderpest and preventive vaccination in various parts of Samarkand, L. Motzarski (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 2, pp. 144–173, fig. 1*).—An account is given of the serious outbreak of rinderpest which occurred in the Province of Samarkand in June, 1903. In combating this outbreak the author carried on a number of experiments in the application of preventive vaccination.

As a result of these experiments it was found that the development of the disease in isolated localities could be quickly and decisively checked by the thorough application of preventive vaccination to all of the cattle. The effect of vaccination on healthy animals was not serious; the curative action of the vaccine gave little encouragement to the use of vaccination for this purpose. The immunity, however, as produced in healthy animals was effective and lasting.

Notes on the different degrees of susceptibility to rinderpest exhibited by the various pure and mixed breeds of bovines and buffaloes submitted to serum test during the years 1899–1903, A. Lingard (*Muktesar, India, 1903, pp. 12*).—During the author's extended investigations of this disease it was found that the breed is a very important factor in determining the dose of serum necessary for producing immunity. It was found that the half-bred hill and plains animals require from 15 to 18 times the quantity of serum which is necessary for producing immunity in plains animals. The cattle and buffaloes from the high regions of the Himalayas are far more susceptible to rinderpest than any of the animals found in the plains regions. The same is true of goats and sheep from the Himalayas region. Half-bred animals exhibit generally the relative insusceptibility of the plains cattle.

The preparation of dry, anti-rinderpest serum, E. Dschunkowsky and J. Kupzis (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 91–94*).—During the experiments reported in this paper it was found possible to obtain a dry antirinderpest serum in a readily transportable form by a desiccation of fluid serum in thin layers upon glass plates after the addition of $\frac{1}{5}$ per cent sodium hydrate. The quantity of dry serum averaged about 10 per cent as great as the fluid serum. The dry serum was readily soluble in water and so far as experiments have been conducted is as effective as the fluid serum.

Infectious abortion among cattle, J. W. Connaway (*Mo. Bul. Missouri State Bd. Agr., 3 (1904), No. 12, pp. 8*).—The cause of this disease and the means of distribution are briefly discussed by the author. Attention is called to the fact that some breeders conceal the presence of outbreaks of the disease and thus contribute to its more extensive distribution. The symptoms of the disease are described and the usual preventive and curative measures are recommended.

Contagious abortion in Montana, H. C. Gardiner (*Montana Sta. Bul. 49, pp. 167–176*).—From circular letters sent to various parts of the State it was found that this disease prevails to an unusual extent among dairy cows of the State. Notes are given on the symptoms of the disease and the methods of transmission and treatment. The author recommends the thorough use of disinfectants in controlling the disease.

The new treatment of milk fever in cows, J. LAW (*Cornell Countryman, 1 (1904), No. 2, pp. 43–48*).—A historical statement is given concerning the various treatments which have been applied in attempts to control this disease. Notes are also given on the nature and symptoms of milk fever. Particular attention is devoted to the treatment of the disease by means of injection of oxygen and air. The details of this treatment are outlined and notes are given on the author's experiments in its application. It is recommended as a highly effective treatment for milk fever.

Suppuration of the milk ducts in cows, E. THIERRY (*Jour. Agr. Prat., n. ser., 7 (1904), No. 10, p. 312*).—When inflammatory processes result in the establishment of suppuration in the teats of cows the author recommends frequent milking and injections of antiseptics, such as borate or fluorid of soda.

Permanent infection of the mammary gland, H. D'ANCHALD (*Jour. Agr. Prat., n. ser., 7 (1904), No. 12, p. 400*).—Attention was called to the importance of mammary affections in dairy cows and to the means by which such troubles can be controlled.

Sterility in cattle, E. THIERRY (*Jour. Agr. Prat., n. ser., 7 (1904), No. 16, pp. 521–523*).—The various causes of sterility or barrenness in cattle are briefly outlined with especial reference to the dietetic, medicinal, and surgical treatments which have been found successful in controlling this trouble.

Actinomycotic orchitis in bulls, I. M. COVALEVSKI (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 3, pp. 254–257*).—Notes are given on the symptoms and pathogenic anatomy of actinomycosis in the testis.

Papillomatosis in cattle, A. ZIMMERMANN (*Fortschr. Vet. Hyg., 2 (1904), No. 1, pp. 18–22, fig. 1*).—The appearance and pathological anatomy of wart-like outgrowths upon the skin of cattle are discussed with especial reference to a generalized case with fatal outcome which came under the author's observation.

Ergotism in cattle, N. S. MAYO (*Industrialist, 30 (1904), No. 25, pp. 399–401*).—During the season of 1902 an unusual amount of ergot was observed on wild rye and wild barley. Brief notes are given on outbreaks of ergotism which occurred during 1903.

Dipping tanks (*Jour. Jamaica Agr. Soc., 8 (1904), No. 3, pp. 93–96*).—Formulas are presented for the preparation of cattle dips containing soda, soap, Stockholm tar, and arsenic. Dips may be used for both horses and cattle, and both kinds of animals may be driven into the same dipping tanks. Brief notes are given on the general physiological effects of dipping upon animals.

Departmental dipping experiments (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 3, pp. 315–317*).—A proprietary dip paste for the destruction of ticks on cattle was given a thorough test. It was found that when used in too strong a solution it destroyed the ticks within 3 days, but affected the appetite of the animals unfavorably and also caused considerable injury to the skin. These unfavorable effects were avoided when the dip was diluted to such an extent that 5 days were required for the destruction of the ticks.

Calcium sulphid as a remedy for mange (*Rev. Asoc. Rural, Uruguay, 32 (1903), No. 20, pp. 490–494*).—The use of lime-sulphur dips is recommended for the control of sheep scab and mange of other domestic animals. Formulas are given for the preparation of these dips, together with notes on the effectiveness of calcium sulphid.

The sheep maggot-fly, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 16 (1904), pp. 128–143*).—In Scotland a number of flies occasionally lay their eggs in the wool of sheep, but the two species of greatest importance are *Lucilia sericata* and *L. cæsar*. The percentage of infestation from these flies in different flocks of sheep varies from 2 to 50 and depends upon various external conditions as well as upon the cleanliness of the wool. Notes are given on the effect of infestation by these maggots and on the conditions which determine their relative abundance as suggested by various sheep raisers.

Circular letters of inquiry sent to sheep men elicited replies which indicate that sheep are quite regularly dipped for destroying these pests, but not always at the proper season of the year. A complaint has been made that the numbers of sheep maggot-flies are somewhat increased as a result of the practice of hanging decaying meat in forest areas as a breeding place for the maggots which are eaten by grouse. In controlling this pest the author recommends cleanliness, dipping, and hand treatment with kerosene or substances with offensive odor.

Prophylaxis of foot-and-mouth disease, P. LABULLY (*Ann. Soc. Agr., Loire, 2. ser., 23 (1903), No. 2, pp. 125, 126*).—Brief notes are given on the production of immunity toward foot-and-mouth disease by means of serum inoculations. Such immunity, however, has been found to be merely temporary.

Acute ulcerative inflammation of the cornea or eye-ball, in cattle, sheep, and goats, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 24 (1904), No. 5, pp. 621–624*).—The symptoms and pathological anatomy of this disease are briefly described. In controlling the disease it is recommended that affected animals be isolated and that the eyes be treated with a weak antiseptic solution, such as corrosive sublimate.

Joint ill (*Jour. Bd. Agr. [London], 11 (1904), No. 2, pp. 110–114*).—This disease affects lambs, calves, and colts. The source of infection is through the umbilical cord at the time of birth. Detailed directions are given regarding the control of the disease in lambs by means of proper disinfectant measures.

Loco, N. S. MAYO (*Industrialist, 30 (1904), No. 30, pp. 473–475*).—The symptoms of loco disease attributed to eating *Astragalus mollissimus* are described. As a result of observations and experiments on this disease the author believes that the disease is a result of malnutrition or starvation, exaggerated perhaps by some injurious substance in the loco weed.

The composition of Zygadenus venenosus and the pharmacological action of its active principle, N. VEJUX-TYRODE (*Jour. Med. Research, 11 (1904), No. 2, pp. 399–402*).—In a study of the bulbs of this plant obtained from Montana the author found a wax-like body, a crystalline neutral substance, an oil, a gum, and two resins. All of these substances are inactive except the resins. From one of the resins a basic body and an acid called zygadinic acid were isolated. The basic body is denominated zygadinein and was found in animal experiments to be the active principle. In minute doses in experimental animals, including guinea pigs, rabbits, and dogs, it produced marked salivation, staggering, and respiratory paralysis followed by death, in some cases within a few minutes, but usually within a few hours.

Osteomalacia and paralysis, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 24 (1904), No. 4, pp. 479–487*).—This disease is believed to be of dietetic origin. It occurs over a large area of Cape Colony, but is most prevalent on the eastern coast. It affects cattle, sheep, goats, and horses, but rarely assumes the paralytic form in horses. Animals affected with the disease manifest intense desire for bones and all kinds of animal-food materials. Notes are given on the pathological anatomy of the disease. In controlling this disease the obvious suggestion is made of adding a daily allowance of bone meal, bone ash, or similar material to the ration.

Observations on epizootic outbreaks of tapeworms in sheep in the Government of Moscow, M. L. BLUMENFELD (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), No. 1, pp. 29–38*).—An account is presented of the extent of infestation of sheep in the Government of Moscow by *Tænia expansa*. The percentage of infestation in different parts of the government is shown in a tabular form. The author concludes that considerable pathogenic action is exercised by the presence of tapeworms in sheep and that these pests cause a great loss to the sheep industry.

The development of Herpetomonas, S. PROWAZEK (*Arb. K. Gesundheitsamte, 20 (1904), No. 3, pp. 440–452, figs. 7*).—The literature of this subject is critically discussed in connection with bibliographical references. Particular attention is given to details in the life history and development of *Herpetomonas muscæ-domesticæ*. The different

forms under which this blood parasite occurs are described, and notes are given on the interrelationships of the different stages of development. Experiments were made in infecting flies with *H. sarcophagæ* which is described as a new species. In one series of experiments 8 out of 100 flies became infected when fed on blood containing this parasite.

The polycephalic bladder worms, especially Cœnurus cerebralis and C. serialis, F. KUNSEMÜLLER (*Zool. Jahrb., Abt. Anat. u. Ontog. Thiere, 18 (1904), No. 4, pp. 507–538, pls. 4, figs. 3*).—Detailed notes are given on the anatomy and developmental stages of these parasites, and the literature of the subject is critically discussed in connection with a bibliography.

Intestinal parasites in hogs, K. W. STOUDER (*Iowa Agr., 4 (1904), No. 4, pp. 167–169*).—Brief notes are given on *Balantidium coli, Echinorhynchus gigas, Ascaris suilla, Trichocephalus crenatus,* and trichina.

Sarcosporidia and their enzyms, H. RIEVEL and M. BEHRENS (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1903), No. 3, pp. 341–352, figs. 4*).—Large numbers of Sarcosporidia were found by the authors in the musculature of a llama. The morphology of these organisms is discussed in detail. A number of inoculation experiments were made with rabbits. It is believed that the organism is different from any species of Sarcosporidia hitherto described. It develops a very virulent poisonous principle which paralyzes the central nervous system, and which appears to resemble an enzym rather than a toxin. It was found possible to immunize rabbits against this organism.

Swine fever, J. D. STEWART (*Jour. Dept. Agr. West Australia, 8 (1903), No. 5, pp. 418–433, figs. 8*).—Notes on the nature, cause, symptoms, and treatment of hog cholera. The author outlines briefly the pathological lesions found in cases of this disease and makes general recommendations regarding the disinfection of premises after outbreaks of the disease and sanitary measures to be adopted in preventing further spread of hog cholera.

The production of a serum for use in the prevention of swine plague and hog cholera, M. PRETTNER (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 94–103*).—In these experiments dogs were used as the source of serum and this serum was tested on white mice. The results of the experiments are set forth in a tabular form. It was found during the author's study of this problem that the serum of dogs immunized toward swine plague possessed protective properties against the bacilli of swine plague and hog cholera. The serum of dogs immunized against hog cholera was likewise active against both diseases. The highest protective property, however, was obtained when the dogs were treated with both species of bacilli.

Diseases which resemble hog cholera, O. MALM (*Norsk Vet. Tidsskr., 16 (1904), No. 2, pp. 25–38*).—The symptoms and pathological lesions of hog cholera, swine plague, and swine erysipelas are described for the purpose of calling attention to the various points of similarity of these diseases and to the means of differentiating them. Notes are also given on the prevalence of these diseases in Norway and on the results obtained by different methods which have been adopted for checking the diseases.

Rachitis in pigs, E. THIERRY (*Jour. Agr. Prat., n. ser., 7 (1904), No. 9, p. 291*).—The cause of this trouble in young pigs is said to be found in an improper dietary containing but little phosphate of lime or other lime salts. In order to prevent the development of a weakness of the bones in young pigs it is recommended that ground bone be added to the usual ration.

The danger of introducing glanders from foreign countries, ARNDT (*Ztschr. Vet. Hyg., 2 (1904), No. 1, pp. 1–5*).—Statistics are presented showing the relative extent of importation of horses from foreign countries into Germany. The bearing of these statistics upon the prevalence of glanders is discussed in a critical manner. In the author's opinion a general scheme for controlling this disease must include supervision of the books of horse dealers, quarantine upon international boundar

lines, and thorough inspection of all imported horses. Special mention is made of the danger of introducing glanders from Russia, and it is suggested that it would be desirable to prohibit the importation of Russian horses if it were not for the fact that so many of these horses are needed.

Horse sickness and its prevention, R. Koch (*Agr. Jour. Cape Good Hope, 24 (1904), No. 4, pp. 505–508*).—This is of the nature of a progress report of the author concerning his investigations of horse sickness in South Africa. Numerous observations have been made on the symptoms and distribution of the disease, together with careful post-mortem examinations. It has been found that animals which recover from the disease are highly immune. Serum obtained from such animals when inoculated into susceptible animals renders the latter immune to natural infection.

Horse sickness, H. Watkins-Pitchford (*Natal Agr. Jour. and Min. Rec., 7 (1904), No. 2, pp. 190–197*).—The author continued his investigations regarding the production of immunity in horses toward this disease. It was found necessary to induce a reactionary fever by means of the virus of the disease. A definite thermal reaction in experimental animals was brought about, whether the virus was introduced hypodermically or into the stomach, and a latent infection or reaction persisted in most cases for many weeks. The degree of immunity brought about by this treatment appears to be rather striking, but has not been tested by exposure of the treated animals to natural infection. During the process of immunization a negative phase is passed through, or a period in which an increased susceptibility to the disease is manifested.

An African trypanosoma pathogenic for horses, A. Laveran and F. Mesnil (*Compt. Rend. Acad. Sci. Paris, 138 (1904), No. 12, pp. 732–735, fig. 1*).—The morphological characteristics of *Trypanosoma dimorphon* are carefully described. The organism is pathogenic for horses, rats, rabbits, guinea pigs, dogs, goats, etc. The species upon which the authors experimented is considered distinct from *T. gambiense*, and notes are given on the characters by which the two species may be differentiated.

Alternation of generation and host in a case of Trypanosoma and Spirochæte, F. Schaudinn (*Arb. K. Gesundheitsamte, 20 (1904), No. 3, pp. 387–439, figs. 20*).—The anatomical and biological characteristics of these two genera are given in detail with especial reference to their easy diagnosis. Particular attention is given to the life history of *Trypanosoma noctuæ*. This organism occurs in the blood of owls and is apparently carried by *Culex pipiens*. The anatomy of these mosquitoes is described with especial reference to their agency in transmitting the blood parasite. Notes are also given on the habits of mosquitoes. The life history of *Spirochæte ziemanni* is described by way of comparison with that of *T. noctuæ*.

Treatment of mal de caderas, M. S. Bertoni (*Rev. Agron., Paraguay, 3 (1903), No. 7–8, pp. 238–240*).—The author discusses briefly the use of arsenate of soda, arsenious acid, potassium permanganate, corrosive sublimate, quinin, and other treatments. The transmission of the disease is believed to be accomplished through the agency of *Stomoxys calcitrans*.

Trypanosoma and trypanosomiasis, with special reference to surra in the Philippine Islands, W. E. Musgrave and M. T. Clegg (*Philippine Dept. Int., Bureau Govt. Lab., 1903, No. 5, pp. 248, figs. 155*).—This report contains a general discussion of animal diseases due to infestation with species of Trypanosoma. The species of this genus which infest oysters, fish, birds, mammals, and man are described and classified in a systematic manner.

The authors discuss also the various modes of transmission and infection by these parasites, the symptoms of different forms of trypanosomiasis in various animals and man, the duration, complications, and diagnosis of these diseases, as well as the pathological anatomy, treatment, and serum therapy. In all cases of trypanosomiasis in which *Trypanosoma evansii* is shown to be the parasite, it is recommended that surra be employed as the proper name of the disease. The life cycle of this parasite

is not completely known at present, but many additional observations upon the subject are made by the authors.

The prevalence of the disease appears to depend largely upon the agency of biting insects, and the authors believe that this is by far the most important mode of transmission, or perhaps the only mode which requires consideration. The question of identity or nonidentity of surra, nagana, dourine, and mal de caderas is considered in detail and the authors incline toward the opinion that these diseases are all one and the same and should be referred to by the term surra.

The micro-organisms of pleuro-pneumonia and influenza in horses and the treatment of these diseases, Z. F. Eleneveski (*Arch. Vet. Nauk, St. Petersburg, 34 (1904), Nos. 2, pp. 93–125; 3, pp. 205–235, pls. 2*).—An elaborate study was made of the symptoms and etiology of these diseases with especial reference to the pathogenic micro-organisms. The latter were cultivated on various nutrient media and notes are given on their biological and morphological characters.

The value of serum therapy was tested by means of numerous experiments. From this study the author concludes that horses may be inoculated with the organisms of contagious pleuro-pneumonia and influenza for the purpose of obtaining a preventive and curative serum. The serum obtained from animals thus treated exercises a preventive action in comparatively small doses and possesses pronounced curative properties. The curative action of this serum is considerably greater than that of the ordinary pharmaceutical preparations which are recommended for treating these diseases in ordinary practice. The application of serum therapy in these diseases brings about great improvement during the early stages.

Bots in horses, S. S. Cameron (*Jour. Agr. and Ind. South Australia, 7 (1904), No. 9, pp. 496–498*).—Brief descriptive, biological, and economic notes on this pest. No satisfactory results are obtained from the administration of ordinary drugs for expelling this parasite. The use of capsules of carbon bisulphid is recommended as somewhat efficacious.

Thymol, H. H. Cousins (*Bul. Dept. Agr. Jamaica, 2 (1904), No. 3, pp. 57, 58*).—Thymol is recommended as the most satisfactory remedy for botflies in horses. It may be dissolved in alcohol containing ten times its quantity of sugar. The mixture is then heated so as to cause the alcohol to evaporate, thus leaving a uniform mixture of thymol and sugar. This remedy may then be administered by mixing it with the grain feed in doses of 15 grains twice per day for 2 days.

Centrifugalization and disintegration in relation to the virus of rabies, J. O. W. Barratt (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), Nos. 5, pp. 633–640; 6, pp. 769–775, fig. 1*).—The author made a study of the nature of rabies virus with special reference to the effect of centrifugalization and disintegration upon it. It was found that when the brain of a rabbit was disintegrated by the use of sand and physiological salt solution the disintegrated material retained its virulence, as shown by the inoculation of healthy rabbits.

In another series of experiments a much more complete trituration was brought about at the temperature of liquid air without the use of sand or salt solution. No purely toxic effect was produced by the injection of an emulsion of centrifugalized brain. When the disintegrated brain substance, however, was used for inoculation the toxic effects appeared at first, but were not noticeable during the second week.

Note on the disintegration of rabid brain substance, J. O. W. Barratt (*Proc. Roy. Soc. [London], 72 (1903), No. 483, pp. 353, 354*).—The author undertook experiments for the purpose of determining whether the virus of rabies contains organized bodies. To this end the brain of a rabbit which had died of rabies was disintegrated with sand at the temperature of liquid carbon dioxid and the disintegrated material was tested by the inoculation of healthy rabbits.

As a result of these experiments it was found that the process of disintegration when carried on for from one-half to one hour is usually sufficient to destroy the

virulence of rabies virus. The disintegration for a period of five minutes was not sufficient to destroy the virulence. Further tests were made during which it was shown that this destruction of the virulence of the rabies virus was not due to the formation of any inorganic substance in disintegrated brain material. The experiments therefore seem to confirm the view that the virus of rabies is of an organized nature.

The passage of rabies virus through filters, P. Remlinger (*Ann. Inst. Pasteur, 18 (1904), No. 3, pp. 150–164*).—A detailed account is presented of experiments carried out by the author in passing rabies virus through filters of various types. The virus was then studied for the purpose of determining the influence of filtration upon its virulence. The evidence obtained by the author in these experiments indicates that rabies should be classified in a special group of diseases quite distinct from those grouped under pathogenic protozoa.

The relation between modifications of the virulence of rabies virus and alterations in Negri's corpuscles, E. Bertarelli (*Centbl. Bakt. u. Par., 1. Abt., Orig., 36 (1904), No. 1, pp. 42–51*).—An attempt was made to determine the relation of Negri's corpuscles to changes in virulence in rabies virus, and to alterations in the central nervous system in infected animals. For this purpose dogs and rabbits were used as experimental animals. The results are set down in detail in a tabular form. It was found that Negri's corpuscles were not much affected by extreme changes in virulence. The corpuscles appeared to possess a greater resisting power to various reagents than the surrounding tissues. The author is in doubt, however, whether these corpuscles should be considered as protozoan organisms or as pathological structures containing such organisms.

Two cases of recovery from experimental rabies, P. Remlinger and M. Effendi (*Ann. Inst. Pasteur, 18 (1904), No. 4, pp. 241–244*).—A detailed account is given of the course and symptoms of two cases of rabies produced by inoculation of dogs. The symptoms in both cases were of a serious nature, and inoculation experiments made subsequently showed that both of the dogs were affected with a virulent form of rabies. The complete recovery which took place in both cases is considered of sufficient rarity to warrant a detailed account.

Experimental rabies in birds, J. von Löte (*Centbl. Bakt. u. Par., 1. Abt., Orig., 35 (1904), No. 6, pp. 741–744*).—Experiments were carried out for the purpose of determining the possibilities of infecting birds with rabies. During these experiments it was found that various birds, including owls and eagles, were susceptible to rabies. Chickens and pigeons are less susceptible to the disease. Only a small percentage of inoculated birds developed the disease, and many of these cases showed a spontaneous recovery.

Fowl cholera and fowl plague, M. Hertel (*Arb. K. Gesundheitsamte, 20 (1904), No. 3, pp. 453–511, pl. 1*).—The results obtained by other investigators in the study of these diseases are briefly pointed out. In the author's experiments the cultures used in the study of fowl cholera were largely obtained from infected geese. Pigeons were found to be the most susceptible of all domestic fowls.

In a series of more than 25 experiments, the organism of fowl cholera was obtained in pure culture from the blood of inoculated pigeons. Since sparrows are almost constantly present in poultry yards and susceptible to fowl cholera, it is suggested that these birds may have some influence in spreading the disease. Rats are comparatively refractory to the disease, while rabbits are very susceptible. The author made a careful study to determine the natural method of infection in fowls. It was found possible to infect fowls readily by feeding the virus along with their food or by bringing the virus in contact with the mucous membranes or feather follicles. The possibility of transmission of the disease through the agency of mites and lice must also be admitted.

Experiments were carried on during which it was found that the fowl cholera bacilli would multiply vigorously when inoculated into fresh eggs. Inoculation experiments showed that the fowl cholera bacilli were capable of retaining their virulence for 48 hours in muck, for 6 days in sand, and for 7 days in sawdust. The donkey was found to produce a very effective serum for fowl cholera. The fowl cholera bacilli were agglutinated by this serum when used in a dilution of 1:1600. Pigeons inoculated with 0.5 cc. of the serum resisted inoculation with virulent cultures of the fowl cholera bacilli. The symptoms, etiology, and distribution of fowl plague are carefully described by way of comparison with fowl cholera. It was found that the virus of fowl plague readily passed through the Berkefeld and Chamberland filters. It is believed to be impossible to differentiate with certainty between fowl cholera and fowl plague by means of any one test.

Spirillosis of fowls, C. LEVADITI (*Ann. Inst. Pasteur, 18 (1904), No. 3, pp. 129–149, pl. 1*).—The literature relating to this subject is briefly reviewed by the author. It was found that when a small quantity of blood containing the virus of the disease was introduced subcutaneously into a fowl, the spirilla could not be found in the general circulation until after a period of 2 days. At the point of inoculation the spirilla were observed in large numbers for about 35 minutes, after which they gradually disappeared.

There seems to be no multiplication of the spirilla at the point of inoculation. The process of multiplication in the general circulation, however, increases until the greatest quantity of spirilla are found at the end of the fifth or sixth day. The serum of fowls which recover possesses quite pronounced agglutinating power. It also brings about at the same time an agglomeration of the white blood corpuscles. The sudden death of a number of fowls which were treated with the serum of recovered birds was attributed to the agglutinating action of this serum. The author suggests that their death was thus caused by embolism as the result of the existence of the agglutinated masses of spirilla and white blood corpuscles.

Minor ailments of poultry, C. E. J. WALKEY (*Jour. Bd. Agr. [London], 10 (1904), No. 4, pp. 476–487*).—Among the more important predisposing causes of diseases in poultry the author mentions damp houses, excessive drafts, filth, and careless breeding. Practical recommendations were made concerning the treatment of apoplexy, bronchitis, bumble-foot, colds, leg weakness, pneumonia, scaly leg, etc. Formulas are given for preparing suitable remedies in treating these various troubles.

Poultry diseases common in Montana, H. C. GARDINER (*Montana Sta. Bul. 50, pp. 191–196*).—Brief notes on the symptoms, etiology, and means of combating roup, catarrh, and gapes, together with a brief account of chicken lice.

AGRICULTURAL ENGINEERING.

Agricultural engineering, S. FRASER (*Cornell Countryman, 1 (1904), No. 6, pp. 170–172, figs. 2*).—A note on the development of instruction and investigation in this line in the United States.

The field for study and development of rural engineering in Nebraska (*Agriculture [Nebraska], 3 (1904), No. 2, pp. 8–13*).—A brief general discussion.

The natural features and economic development of the Sandusky, Maumee, Muskingum, and Miami drainage areas in Ohio, B. H. FLYNN and MARGARET S. FLYNN (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 91, pp. 130, figs. 11*).—This paper, which treats of the natural features and development of the four principal drainage areas of Ohio, contains valuable data with reference to the flow of the Maumee, Sandusky, Miami, and Muskingum rivers, and the natural advantages they offer with reference to water power and domestic water supply. "Of particular interest is that part of the paper which deals with the early history of the water powers, their general relation to the canal systems of Ohio, and the

decline in value that has taken place since the establishment of modern methods of manufacturing, trade, and transportation.

"The chapter dealing with public water supplies comprises unusually complete information with reference to the sources, equipment, and value of the systems that were installed during the latter part of the last century."

Irrigation in India, H. M. WILSON (*U. S. Geol. Survey, Water Supply and Irrig. Paper No. 87, pp. 238, pls. 27, figs. 66*).—A second edition of this report revised and brought up to date. "The most important feature of the revision is the bringing of all the financial and statistical data concerning the more important works in each province up to 1901, the date of the last official Indian reports.

"At the close of 1901 the area of India, including native States, was 1,559,603 square miles, the total population was 294,266,701, and the total expenditure upon all classes of irrigation works by the government of India had been $337,850,000. In the year 1900–1901 the expenditures on account of irrigation amounted to $11,500,000 and the revenues to $12,075,000, showing a profit of 7.5 per cent on the capital outlay for construction. The total area cultivated in India the same year was 180,151,093 acres, and the total area irrigated was 18,611,106 acres, or, counting areas double cropped or those irrigated more than once in a season, the area irrigated was 33,096,031 acres.

"The estimated value of the irrigated crops in 1900–1901 was $150,000,000, and of these it is interesting to note that the area under cultivation in wheat amounted to over 16 million acres, and in cotton to over 8⅓ million acres, and that the total value of the latter crop alone was $52,773,000."

Notes on irrigation in the valley of the Tumbez (*Données sur les irrigations de la vallée de Tumbes. Lima, Peru: Min. Agr. et des Travaux Publics, 1902, pp. 28, pls. 3, maps 2*).

Address of Hon. Joseph W. Hunter, State Highway Commissioner, delivered at annual meeting of State Board of Agriculture, January 28, 1904 (*Pennsylvania State Dept. Agr. Bul. 121, pp. 15*).—This address discusses the act of the State legislature of April 15, 1903, creating a department of public highways and explains what has already been done under its provisions.

Historic highways of America, A. B. HULBERT (*Cleveland, Ohio: Arthur H. Clark Co., 1904, vol. 8, pp. 237, pls. 2, maps 4; 1903, vol. 9, pp. 220, maps 3; 1904, vol. 10, pp. 207, pls. 3, maps 2; 1904, vol. 11, pp. 201, pls. 7*).—These volumes deal with the military roads of the Mississippi Basin (the conquest of the old Northwest), the waterways of westward expansion (the Ohio River and its tributaries), the Cumberland road, and pioneer roads and experiences of travelers. For a notice of previous volumes of this series see E. S. R., 15, p. 415.

Tenth annual report of the commissioner of public roads for the year ending October 31, 1903, H. I. BUDD (*Somerville, N. J.: The Unionist Gazette Assoc., 1904, pp. 262, pls. 40, map 1*).—The report includes descriptions of the roads built in 1903, with statements of their cost, the text of the public roads act of April 1, 1903, and the standard specifications for different kinds of roads.

The international good roads convention (*Engineer. News, 51 (1904), No. 21, pp. 494–496*).—An account of the convention held at St. Louis May 16–21 under the auspices of the National Good Roads Association.

Oil engines for agricultural purposes, W. W. BEAUMONT (*Jour. Bd. Agr. [London], 10 (1904), No. 4, pp. 435–460, figs. 18*).

Systems and methods of mechanical refrigeration, S. H. BUNNELL (*Engineer. Mag. and Ind. Rev., 27 (1904), No. 3, pp. 397–408*).—A general discussion of the history, advantages, and disadvantages of different methods.

The cold-storage building and experiments, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1903, pp. 14, 15*).—Brief notes are given on the success in

maintaining uniform temperatures under a variety of conditions in the cold-storage building described in an earlier report (E. S. R., 15, p. 95).

The modern silo, T. CHERRY (*Jour. Dept. Agr. Victoria, 2 (1903), No. 4, pp. 320–331, pls. 3, figs. 4; Dept. Agr., Victoria, Bul. 8, pp. 14, pls. 3, figs. 4*).—A popular discussion of the construction of silos and the preparation and use of silage, with special reference to Australian conditions.

Windmills, R. GAGEY (*Bul. Agr. Algérie et Tunisie, 10 (1904), Nos. 5, pp. 91–104, figs. 34; 6, pp. 111–130, figs. 31*).—This article discusses the construction, operation, and efficiency of a large number of different forms as well as the uses to which they may be put in Tunis, including pumping, grinding, etc.

MISCELLANEOUS.

Sixteenth Annual Report of Alabama College Station, 1903 (*Alabama College Sta. Rpt. 1903, pp. 24*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; and reports of the director and agriculturist, chemists, plant physiologist, veterinarian, and horticulturist on the work of the station during the year.

Thirteenth Annual Report of Kentucky Station, 1900 (*Kentucky Sta. Rpt. 1900, pp. XLII+244*).—The report proper contains the organization list; a financial statement for the fiscal year ended June 30, 1900; and reports of the director and heads of departments, parts of which are noted elsewhere. Reprints of Bulletins 86–90 of the station on the following subjects are appended: Inspection and analyses of foods (E. S. R., 12, p. 586); Kentucky forage plants—the grasses, analyses of some Kentucky grasses (E. S. R., 12, p. 547); analyses of commercial fertilizers (E. S. R., 12, p. 1026); wheat (E. S. R., 12, p. 1035); and commercial fertilizers (E. S. R., 13, p. 124).

Sixteenth Annual Report of Vermont Station, 1903 (*Vermont Sta. Rpt. 1903, pp. 292+XXXIV*).—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1903; a report of the director reviewing the work of the station during the year and giving abstracts of Bulletins 96–99 of the station; and reports of the heads of departments, containing a number of articles abstracted elsewhere in this issue.

Abstract of Sixteenth Annual Report, 1903 (*Vermont Sta. Bul. 106, pp. 225–272*).—This is a popular résumé of the annual report of the station noted above, and is intended for general distribution in place of the report, which is printed in only a limited edition.

Experiment Station Work, XXV (*U. S. Dept. Agr., Farmers' Bul. 193, pp. 32, figs. 9*).—This number contains articles on the following subjects: Watermelons in the North, watermelon culture in Georgia, muskmelon culture in the North, Rockyford muskmelons, cold storage of fruits, selection of seed corn, bread and toast, cooking meat, and bitter milk.

Crop Reporter (*U. S. Dept. Agr., Bureau of Statistics Crop Reporter, vol. 5, Nos. 10, pp. 77–84; 11, pp. 85–92; 12, pp. 93–100*).—These numbers for February, March, and April, 1904, contain the usual statistical reports on the crops in the United States and foreign countries.

An outline of cooperative demonstrations and tests for 1904 (*New York Cornell Sta. Bul. 216, pp. 118–122*).—This is a list of the demonstrations or experiments in agronomy, plant selection and breeding, horticulture, entomology, animal husbandry, poultry husbandry, and dairy industry which it is proposed to conduct during the season of 1904, in cooperation with farmers throughout the State.

NOTES.

Colorado Station.—J. E. Payne, field agent, has resigned.

Hawaiian Sugar Planters' Station.—E. G. Clarke has been appointed agriculturist.

Purdue University and Station.—At a meeting of the board of trustees of the university, held June 7, 1904, resolutions involving a change in the organization of the experiment station were adopted. The work, equipment, staff, income, and expenses of the State chemist were placed under the control of the experiment station and become a part of its organization. The farm, except such areas as are now or may hereafter be set aside for permanent experimental purposes, is to be under the care of the university to maintain and administer. The permanent experimental fields and buildings are to be occupied and used by the station without rent, and the proceeds of the same will be appropriated to the use of the station. The station is to bear all costs of labor and materials used in experimental work, and it is understood that in its work the station is to receive the aid and cooperation of the university in every possible way.

Maine University.—J. E. Burbank, instructor in physics, has resigned to accept a position in the Magnetic Survey, at Washington. L. E. Woodman, formerly assistant in physics at Dartmouth, has been elected to fill the vacancy.

Maryland College and Station.—C. F. Austin, associate horticulturist in the college and station for the past two years, resigned to accept the position of horticulturist at the Central Cuba Station.

Massachusetts College.—The recent legislature increased the permanent appropriation of the college by $10,000 annually. The provision for a horticultural building was withdrawn.

Minnesota Station.—L. B. Bassett has been appointed farm foreman.

Montana College and Station.—John Maxey, of Bozeman, has been appointed a member of the governing board, vice John M. Robinson, whose term expired. The latter succeeds Joseph Kountz, whose term expired. S. Fortier, professor of civil engineering in the college, and director and irrigation engineer of the station, who for the past year has been absent on leave and in charge of work under the irrigation division of the Office of Experiment Stations in California, has resigned to continue work with the Department and the University of California. F. B. Linfield, agriculturist and for the past year acting director, has been made director of the station. J. S. Baker, a graduate of the Utah Agricultural College, for the past year professor of civil engineering in the Montana College, has been elected to the position of irrigation engineer of the station, vice S. Fortier. Alfred Atkinson, a graduate of the Iowa Agricultural College, has been elected to the position of assistant in agronomy. Herbert Reese, a graduate of the Montana Agricultural College, has been made assistant chemist.

Oklahoma College and Station.—F. O. Foster, assistant in dairying at the college and in agriculture at the station, has resigned to engage in commercial dairying in Baltimore. A dairy building to cost $4,000 and a greenhouse to cost $3,000 are now under construction.

Rhode Island College and Station.—A. E. Stene, assistant horticulturist at the college and station, has been transferred to the demonstration and extension department of the college. He will be succeeded in the regular college and station work by Maurice Blake, a graduate of the Massachusetts Agricultural College.

Utah College.—J. A. Bexell, head of the commerce department, has been made secretary of the governing board, vice P. W. Maughan, resigned.

Virginia College and Station.—A. M. Soule, formerly director of the Tennessee Station, has been elected dean of the department of agriculture of the college and director of the station, to take effect September 1.

Wisconsin Station.—W. B. Richards, assistant in animal husbandry at the station, has been elected to a similar position in North Dakota. He will be succeeded at Wisconsin by J. G. Fuller, a graduate of the Wisconsin Agricultural College.

Wyoming University.—President Lewis of the university died, after a brief illness, June 19.

First Convention of the American Civic Association.—The American Civic Association is the name of a new organization formed by the consolidation of the American Park and Outdoor Art Association and the American League of Civic Improvement. These are strong national organizations, which for a number of years have been working along the same lines, each duplicating to a certain extent the work of the other. Committees have been working on the plan for two years, and the union of the two organizations was finally brought about at their recent joint convention at St. Louis, June 9 to 11. The active propaganda of the association will be conducted largely through departments under the leadership of departmental vice-presidents and secretaries.

The officers elected were as follows: President, J. Horace McFarland, Harrisburg; first vice-president, Clinton Rogers Woodruff, Philadelphia; general vice-presidents, George Foster Peabody, New York, Franklin MacVeagh, Chicago; secretary, Charles Mulford Robinson, Rochester; treasurer, William B. Howland, New York. Woman's Outdoor Art League: President, Mrs. Charles F. Millspaugh, Chicago; first vice-president, Mrs. Sylvester Baxter, Boston; second vice-president, Mrs. Basil Duke, Louisville, Ky.; recording secretary, Mrs. George T. Banzet, Chicago; corresponding secretary, Mrs. Francis Copley Seavey, Chicago; treasurer, Mrs. William H. Crosby, Racine, Wis.; directors, Mrs. W. J. Washburn, Los Angeles, Cal.; Mrs. H. B. Stearns, New Orleans; Mrs. A. W. Sanborn, Ashland, Wis.; Miss Elizabeth Bullard, Bridgeport, Conn.

The departments of work of the American Civic Association and their respective vice-presidents are as follows: Public recreation, Joseph Lee, Boston; arts and crafts, Mrs. M. F. Johnston, Richmond, Ind.; city making, F. S. Lamb, New York; outdoor art, Warren H. Manning, Boston; factory betterment, Edwin L. Shuey, Dayton, Ohio; children's gardens, Dick J. Crosby, Washington, D. C.; libraries, H. Putnam, Library of Congress, Washington, D. C.; parks and public reservations, G. A. Parker, Hartford, Conn.; rural improvements, O. C. Simonds, Chicago; school extension, Charles Zueblin, Chicago; social settlements, Frank Chapin Bray, Chicago; press, Mrs. Condé Hamlin, St. Paul.

Agricultural Education.—The Travelers' Protective Association at its annual convention in Springfield, Ill., June 8, adopted resolutions favoring radical changes in our educational system. The resolutions demand among other things that "our entire educational system should be so remodeled as to teach every child to be a lover of nature and the country, and to train them toward the land as a source of livelihood rather than away from it, and thus counteract the drift of population to the cities and turn it back to the land;" that farm training schools should be established by county, municipal, State, and the National governments; that what remains of our public domain "should be sacredly reserved for actual home builders," and "that a permanent committee on education, irrigation, forestry, and lands should be appointed by this association," and that this committee should formulate without delay a plan for actively enlisting the personal cooperation of all members of this association in the movement for thus modifying our educational system.

Agricultural Education in England.—At the conclusion of an address upon this subject by J. C. Medd, the following suggestions were made for placing the rural and agricultural education upon a more satisfactory basis: "1. Close small village schools and convey their children daily to some central school. This would insure better buildings and equipment, more regular attendance, and a more efficient staff. This has been already done in parts of the United States and Canada. 2. Develop a few favorably situated schools upon the model of the Écoles primaires supérieures. The full course at these schools extends over three years, and for the first year the instruction is general. Afterwards the pupils enter one or other of the following sections: (a) Commercial, (b) industrial, (c) agricultural. The schools founded by Lady Warwick at Bigods, and by the Duchess of Sutherland at Goldspie, are somewhat analogous to these. 3. Organize a continuation school in every village with such a curriculum as that previously described. 4. Establish winter schools of agriculture and horticulture in selected districts according to the particular requirements and characteristics of each county, and make the services of their directors available for all farmers and gardeners during the summer. 5. Put demonstration plats in the charge of men who combine scientific accuracy with some actual knowledge of practical farming, and are in touch with the farmers of the district. 6. Provide liberal scholarships to pass capable children by successive stages from the elementary school to the collegiate center, to which each county should be affiliated."

As evidence of the increasing appreciation of the facilities offered by institutions of varying grades, the following statistics were appended: "Fifty-four pupils passed through the Basing School Farm (which can only accommodate 16 pupils at a time) last year, of whom 90 per cent were the sons and daughters of farmers. The number of boarders at the Dauntsey Agricultural School, which is too isolated for many day pupils, has risen from 11 in 1900 to 38 in 1904; of these, almost all follow the agricultural course. At the Harper Adams Agricultural College the number of students is 45, about 70 per cent of whom are the sons of landowners, land agents, or farmers. Within the past two years the number at Wye Agricultural College has increased from 49 to 72, about half of whom are by birth associated with the land."

Victoria School of Horticulture.—In a recent report of the principal of this school, the following summary is given regarding the value of horticultural instruction for women as observed at the school: "Of about 140 women students attending, about 10 per cent may be said to have thoroughly mastered some branch of profitable horticulture. Another 20 per cent gained as much experience and habit of work as to make them capable helpers or directors of their own properties. The remainder of the students gave no definite proof of what they may be able to do in the future. A few students are earning a livelihood wholly, or in part, through their experience gained here. Two are engaged in designing and maintaining gardens. One is managing a small mixed estate. One is a writer on horticulture, one or two take pruning contracts, and one has laid out and managed a young orchard of considerable extent in such a business-like manner as to warrant the assertion that of its age and character there is no property to equal it for general excellence in the State of Victoria."

The New Building of the Seed Control Station of Vienna.—A recent number of *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich* gives an illustrated account of the new building and grounds of this station and briefly reviews the history of the institution since its establishment in 1881. The plat on which the building stands has a total area of a little less than an acre, of which the building covers 552 square meters (5,941.67 square feet), and test plats occupy 400 square meters (4,305.55 square feet). The building is of artificial stone, with tile roof, and was constructed at a cost of $36,236.73, exclusive of internal equipment. It contains 35 rooms, of which 5 are used for offices and library, 18 for laboratories, 5 for mailing

and storage purposes, and 8 are available for miscellaneous purposes. The building is provided with the best modern arrangements for heating, lighting, ventilation, and sanitation. Laboratories fully equipped with the most approved appliances and machines, many of which are of special design, are provided for botanical, microscopic-physiological and plant-breeding investigations, analytical work, germination tests, baking experiments, and studies of Alpine plants. The test plats furnish a means for studies in breeding of cereals and for growth of typical varieties of cereals, leguminous plants, grasses, and other useful plants, as well as weeds, etc. The station is especially well equipped for studies in breeding of cereals (including baking tests), and this is to be a prominent feature of its work.

Miscellaneous.—There has been recently established by the National Society of Agriculture of France, a committee for the purpose of securing and erecting a monument to the memory of the late Louis de Vilmorin. The personnel of this committee is given in *Journal d'Agriculture Pratique*, n. ser., 7 (1904), No. 18, pp. 374, 375. The list embraces the names of many individuals who are prominent in agriculture and allied subjects in France and elsewhere. The American membership consists of Prof. C. S. Sargent, director of the Arnold Arboretum, Boston, Mass.; Dr. William MacMurtrie, president of the Chemical Society of New York; and D. M. Ferry, seed dealer, Detroit, Mich. Subscriptions to the fund for the erection of this monument may be addressed to the treasurer of the committee, Léon Bourguignon, 26 Rue Jacob, Paris.

Jean Dufour, professor of plant pathology and director of the viticultural station connected with the agricultural experiment station of the Agricultural Institute, Lausanne, Switzerland, died late in 1903, in his forty-fourth year. An account of his life and work is given by two of his colleagues in *Chronique agricole du Canton de Vaud*, 17 (1904), Nos. 5, pp. 165–171; 7, pp. 235–242, of which journal Dufour was one of the founders and editors.

Dr. H. C. Müller, vice-director of the experiment station and farm at Halle, has been appointed director of the chemical control station at the same place, to succeed Dr. L. Bühring, deceased. Dr. W. Krüger, at the head of the bacteriological division of the Halle Station, has succeeded Dr. Müller as vice-director.

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